

(19)



(11)

EP 2 929 804 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
14.10.2015 Bulletin 2015/42

(51) Int Cl.:
A47B 88/00 (2006.01) A47B 88/04 (2006.01)

(21) Application number: **14163984.9**

(22) Date of filing: **09.04.2014**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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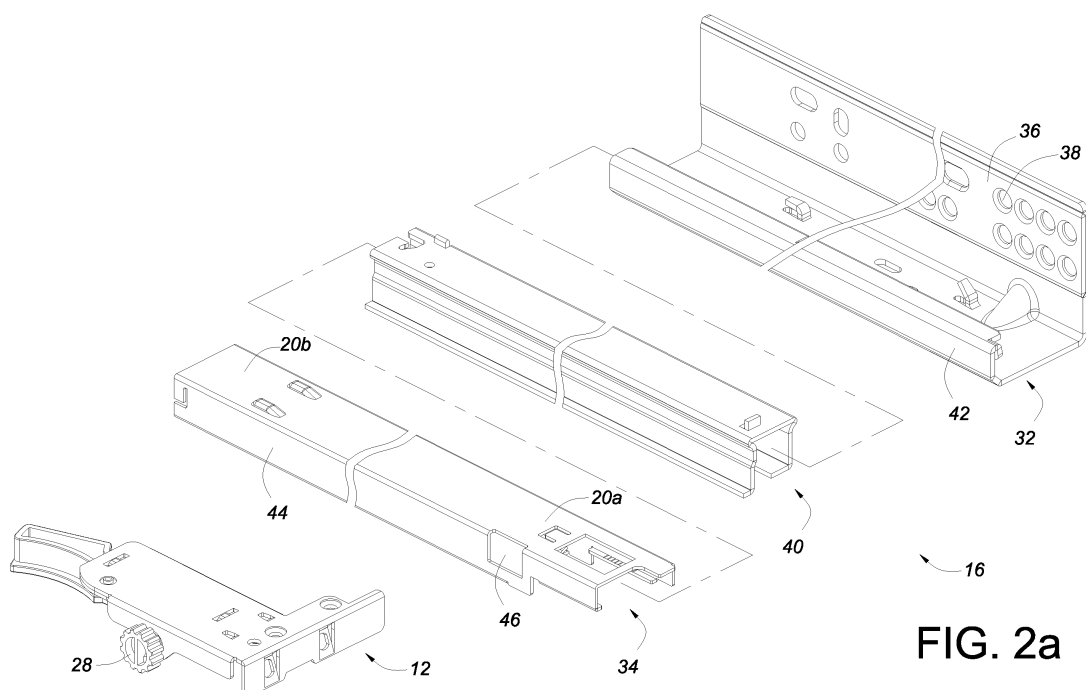
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(54) **Slide rail system and connecting device used for slide rail assembly**

(57) A slide rail assembly (16) includes first and second rails (32, 34). The second rail (34), slidable relative to the first rail (32), has a mounting hole (46). A connecting device (12) includes first and second units (48, 50), an engaging element (52), and an adjusting element (28). The second unit (50) has a transverse guiding portion (80) located at its counterpart (62) of the first unit (48). The engaging element (52), connected to the second unit

(50), has an engaging portion (98) partially located in the mounting hole (46) to connect the connecting device (12) to the second rail (34). The adjusting element (28) is connected to both units (48, 50). The second unit (50) is displaceable in response to rotation of the adjusting element (28), thereby enabling displacement of the engaging portion (98) relative to the mounting hole (46).

**FIG. 2a****EP 2 929 804 A1**

Description

Field of the Invention

[0001] The present invention relates to slide rails and more particularly to a slide rail system and a connecting device used therein for connecting a slide rail assembly.

Background of the Invention

[0002] Undermount drawer slides are a type of hidden slide rails. Typically, an undermount drawer slide is mounted on the bottom of a drawer so that, when the drawer is pulled out with respect to a frame (e.g., a cabinet), the undermount drawer slide stays hidden at the bottom of the drawer and is not exposed to view. Such an undermount drawer slide generally has an L-shaped bracket and a slide rail. The bracket is mounted on a wall surface of a cabinet, and the slide rail is arranged on the bracket and longitudinally slidable relative to the rail on the bracket. A drawer mounted on the slide rail can be pulled out with respect to the cabinet or pushed back into the cabinet via the slide rail.

[0003] However, due to minor errors in the mounting process or some external factors, the connecting device of the drawer may have problem being mounted to the slide rail.

[0004] To solve this problem, US Patent Application Publication No. 2012/0292465 A1, titled "Coupling device having side adjustment for a drawer", discloses a coupling device configured for a drawer and featuring transverse adjustability. The coupling device (5) serves mainly to detachably couple a drawer to an extendable rail. The relationship between the spiral disk (15) of the adjusting wheel (8) of the coupling device (5) and the tooth-shaped holding elements (21) of a mounting plate (16) is such that, when the adjusting wheel (8) is adjusted, the latching portion (10) of the coupling device (5) is driven, allowing abutment surfaces (10a, 10b, 10c) of the latching portion (10) to be adjusted in position relative to the carcass rail (3c) of an extension guide (3). In other words, the drawer (2) is transversely adjustable in position relative to the carcass rail (3c) of the extension guide (3) to eliminate minor mounting errors between the drawer and the carcass rail.

[0005] In addition, US Patent Application Publication No. 2012/0319548 A1, titled "Pull-out guide for a drawer", discloses in paragraph [0081], FIG. 2b, and FIG. 4 of its specification a holding element (5) mounted at the rear end of the extension rail (3a) of an extension guide (3). The holding element (5) has a holding nose (15) mounted in a bore of a drawer rear wall (2d). According to paragraphs [0082, 0083] and FIG. 5a of the specification, when a pivotal movement of an adjusting lever (18) is transmitted to lateral abutment surfaces of the holding element (5), a connecting element (7) and the holding nose (15) are displaced along a pair of guide bars (14). Therefore, the holding nose (15) of the extension rail (3a)

can be adjusted in position relative to the drawer (2) in a transverse direction to eliminate mounting errors, which if existing may hinder installation of the drawer (2) on the holding nose (15) of the extension rail (3a). However, the numerous components of the holding element (5)-namely an adjustment device (11), a support element (17), a holding portion (19), and guide pins (14), in addition to the adjustment lever (18), the connecting element (7), and the holding nose (15) of the connecting element (7)-are to the disadvantage of the overall production cost and manufacturing process; in other words, the holding element (5) still leaves room for improvement.

Summary of the Invention

[0006] The present invention relates to a slide rail system which allows the connecting position of a drawer to be adjusted relative to a slide rail in a transverse direction. The present invention also relates to a connecting device used in the slide rail system to connect a slide rail assembly.

[0007] According to one aspect of the present invention, a slide rail system includes a slide rail assembly and a front connecting device. The slide rail assembly includes a first rail and a second rail. The second rail is longitudinally slidable relative to the first rail. The second rail has a longitudinally extending main body, a front portion, and a mounting hole adjacent to the front portion. The front connecting device includes a first unit, a second unit, an engaging element, and an adjusting element. The first unit has at least one transverse guiding portion. The second unit has at least one transverse guiding portion located at the transverse guiding portion of the first unit. The engaging element is connected to the second unit and has an engaging portion. At least a portion of the engaging portion is located in the mounting hole of the second rail. The adjusting element has an adjusting portion and a screw rod. The screw rod is connected to the first unit and the second unit. The second unit is displaceable relative to the second rail in response to rotation of the adjusting portion of the adjusting element so that the engaging portion of the engaging element can be displaced relative to the mounting hole of the second rail.

[0008] Preferably, the second unit further includes a first sidewall with a hanging hole, and the first unit further includes a sidewall with a threaded hole. The screw rod of the adjusting element is threadedly connected to the threaded hole while the second unit hangs on a neck of the screw rod via the hanging hole. The second unit preferably further includes a second sidewall which is opposite the first sidewall and which has a wall hole. The engaging portion of the engaging element corresponds in position to the wall hole.

[0009] Preferably, the engaging element further includes an elastic arm. When the adjusting portion of the adjusting element is rotated, the second unit is displaced relative to the second rail, the engaging portion of the

engaging element if not yet corresponding in position to the mounting hole of the second rail is pressed against a sidewall of the second rail and pivoted by a predetermined angle such that the elastic arm stores an elastic energy, and the engaging portion of the engaging element, once corresponding in position to the mounting hole, enters the mounting hole due to the elastic energy released by the elastic arm. Preferably, the engaging element further includes a slot, and the front connecting device further includes a disengaging element pivotally connected to the second unit. The disengaging element has a disengaging portion located in the slot. When the disengaging element is pivoted, the disengaging portion of the disengaging element drives the engaging element via the slot and thereby pivots the engaging element; consequently, the engaging portion of the engaging element is displaced relative to the second rail and separates from the mounting hole.

[0010] Preferably, the second rail further has a rear portion opposite the front portion, and the rear portion is provided with a rear connecting device. The rear connecting device includes a main body, a locking element, and a movable element. The main body includes a supporting portion and a transverse portion substantially perpendicularly connected to the supporting portion. The locking element is pivotally connected to the supporting portion of the main body and includes a head and a locking rod connected to the head. The locking rod has a contact portion. The movable element is movably provided between the main body and the locking element. The movable element includes a first plate portion and a second plate portion substantially perpendicular to the first plate portion. When the head of the locking element is rotated to a first position, the contact portion of the locking rod is pressed against the first plate portion of the movable element such that the movable element is positioned on the main body. Once the head of the locking element is rotated from the first position to a second position, the contact portion of the locking rod is no more pressed against the first plate portion of the movable element, and the movable element is therefore allowed to be displaced relative to the main body.

[0011] Preferably, the supporting portion of the main body of the rear connecting device includes a first vertical wall and a second vertical wall, and the transverse portion of the main body of the rear connecting device has two opposite lateral sides respectively and substantially perpendicularly connected to the first vertical wall and the second vertical wall. Each of the first vertical wall and the second vertical wall has a through hole, and the through holes correspond in position to each other. The locking rod of the locking element extends through the through holes of the first vertical wall and the second vertical wall. The movable element preferably has a width less than a width between the first vertical wall and the second vertical wall so that the movable element can be displaced between the first vertical wall and the second vertical wall. Preferably, the transverse portion of the main body

of the rear connecting device includes a plurality of fixing portions which are arranged at intervals, and the first plate portion of the movable element includes a fixing portion corresponding in position to one of the fixing portions of the transverse portion of the main body of the rear connecting device. When the head of the locking element is rotated to the first position, the contact portion of the locking rod is pressed against the first plate portion of the movable element such that the fixing portion of the first plate portion of the movable element is engaged with one of the fixing portions of the transverse portion of the main body of the rear connecting device. Once the head of the locking element is rotated from the first position to the second position, the contact portion of the locking rod is no more pressed against the first plate portion of the movable element, and the fixing portion of the first plate portion of the movable element is therefore disengaged from the one of the fixing portions of the transverse portion of the main body of the rear connecting device.

[0012] According to another aspect of the present invention, a connecting device used for a slide rail assembly includes a first unit, a second unit, an engaging element, and an adjusting element. The first unit has at least one transverse guiding portion. The second unit has at least one transverse guiding portion located at the transverse guiding portion of the first unit. The engaging element is connected to the second unit and has an engaging portion. The adjusting element has an adjusting portion and a screw rod, wherein the screw rod is connected to the first unit and the second unit. The second unit is displaceable in response to rotation of the adjusting portion of the adjusting element so that the engaging portion of the engaging element can be displaced.

[0013] Preferably, the at least one transverse guiding portion of the first unit includes a transverse guiding hole, and the at least one transverse guiding portion of the second unit includes a protruding block.

[0014] Preferably, the second unit further includes a first sidewall with a hanging hole, and the first unit further includes a sidewall with a threaded hole. The screw rod of the adjusting element is threadedly connected to the threaded hole while the second unit hangs on a neck of the screw rod via the hanging hole. The second unit preferably further includes a second sidewall which is opposite the first sidewall and which has a wall hole. The engaging portion of the engaging element corresponds in position to the wall hole.

[0015] Preferably, the engaging element further includes an elastic arm and a slot, and the connecting device further includes a disengaging element pivotally connected to the second unit. The disengaging element has a disengaging portion located in the slot.

[0016] One technical feature of the embodiments of the present invention is that an operator can adjust the connecting position of a drawer with respect to the slide rail assembly in a transverse direction by means of the adjusting element of the front connecting device. Another technical feature is that the locking element of the rear

connecting device makes it possible for the operator to adjust the mounting position of the slide rail assembly with which the drawer is to align.

Brief Description of the Drawings

[0017] The invention as well as a preferred mode of use and the advantages thereof will be best understood by referring to the following detailed description of some illustrative embodiments in conjunction with the accompanying drawings, wherein:

FIG. 1 is an assembled perspective view showing how a drawer is mounted on slide rail assemblies by means of connecting devices according to an embodiment of the present invention;

FIG. 2a is an exploded perspective view of the slide rail assembly and front connecting device on a single side of FIG. 1;

FIG. 2b is an exploded perspective view of the rear connecting device and second rail (only a rear portion thereof is shown) on a single side of FIG. 1;

FIG. 3 is an exploded perspective view of the first front connecting device in FIG. 1;

FIG. 4a is a schematic drawing in which mounting errors between the engaging portion of the front connecting device and a mounting hole of the slide rail assembly prevent the front connecting device from being properly connected to the mounting hole in the second rail of the slide rail assembly;

FIG. 4b is another schematic drawing in which mounting errors between the engaging portion of the front connecting device and a mounting hole of the slide rail assembly prevent the front connecting device from being properly connected to the mounting hole in the second rail of the slide rail assembly;

FIG. 5a is a schematic drawing in which the adjusting portion of the adjusting element has been adjusted to adjust the distance between the second unit and the second rail of the slide rail assembly;

FIG. 5b is a schematic drawing in which the adjusting portion of the adjusting element has been adjusted, allowing the engaging portion of the engaging element of the front connecting device to be mounted in the mounting hole in the second rail of the slide rail assembly;

FIG. 6a is a schematic drawing in which the disengaging element of the front connecting device has yet to be adjusted;

FIG. 6b is a schematic drawing in which the disengaging element in FIG. 6a has been adjusted such that the engaging element is pivoted by a predetermined angle;

FIG. 7 is an exploded perspective view of an embodiment of the rear connecting device in the present invention;

FIG. 8a is a schematic drawing showing operation of the rear connecting device in FIG. 7 after assembly;

FIG. 8b is another schematic drawing showing operation of the rear connecting device in FIG. 7 after assembly;

FIG. 9 schematically shows how the movable element of the rear connecting device in FIG. 7 can be adjusted in position;

FIG. 10 schematically shows how the first plate portion of the movable element in an embodiment of the present invention is aligned with a positioning hole in the back panel of a drawer;

FIG. 11a is a schematic drawing showing operation of the second embodiment of the rear connecting device in the present invention;

FIG. 11b is another schematic drawing showing operation of the second embodiment of the rear connecting device in the present invention;

FIG. 12a is a schematic drawing showing operation of the third embodiment of the rear connecting device in the present invention; and

FIG. 12b is another schematic drawing showing operation of the third embodiment of the rear connecting device in the present invention.

Detailed Description of the Invention

[0018] FIG. 1 shows how a drawer 10 is mounted on a first slide rail assembly 16 and a second slide rail assembly 18 by means of a first front connecting device 12 and a second front connecting device 14. The first slide rail assembly 16 includes a front portion 20a and a rear portion 20b opposite the front portion 20a. The second slide rail assembly 18 includes a front portion 22a and a rear portion 22b opposite the front portion 22a.

[0019] More specifically, the first front connecting device 12 and the second front connecting device 14 are respectively arranged on two lateral sides of the bottom of the drawer 10. The first front connecting device 12 is mounted at the front portion 20a of the first slide rail assembly 16, and the second front connecting device 14 is

mounted at the front portion 22a of the second slide rail assembly 18. In addition, the rear portion 20b of the first slide rail assembly 16 is mounted with a first rear connecting device 24, and the rear portion 22b of the second slide rail assembly 18 is mounted with a second rear connecting device 26.

[0020] In one preferred embodiment, one of the first front connecting device 12 and the second front connecting device 14 has an adjusting element 28. With the adjusting element 28, an operator can adjust the connecting position of the drawer 10 relative to the corresponding slide rail assembly (e.g., the first slide rail assembly 16 or the second slide rail assembly 18) in a transverse direction. Also, one of the first rear connecting device 24 and the second rear connecting device 26 has a locking element 30. With the locking element 30, the operator can adjust the mounting position of the corresponding slide rail assembly (e.g., the first slide rail assembly 16 or the second slide rail assembly 18) with which the drawer 10 is to align.

[0021] In practice, only one of the slide rail assemblies (e.g., the first slide rail assembly 16 or the second slide rail assembly 18) is required to be equipped with the front connecting device and the rear connecting device to achieve the aforesaid effects.

[0022] The first slide rail assembly 16 is now described in more detail with reference to FIG. 2a and FIG. 2b. The first slide rail assembly 16 includes a first rail 32 and a second rail 34. The first rail 32 has a wall portion 36 provided with at least one positioning hole 38 so that the first rail 32 can be mounted to a frame (e.g., a cabinet) by passing a fastener (not shown) through the positioning hole 38.

[0023] In one preferred embodiment, a third rail 40 is further provided between the first rail 32 and the second rail 34. The third rail 40 is configured to extend the sliding distance of the second rail 34 relative to the first rail 32, thus allowing the drawer 10 to be displaced farther from the frame. In practice, however, the third rail 40 is optional, meaning that the first rail 32 and the second rail 34 alone are sufficient to enable displacement of the drawer 10 relative to the frame.

[0024] More specifically, the first rail 32 has a longitudinally extending main body 42. The second rail 34 can slide longitudinally relative to the first rail 32. The second rail 34 has a longitudinally extending main body 44, the front portion 20a, the rear portion 20b opposite the front portion 20a, and a mounting hole 46 adjacent to the front portion 20a.

[0025] The first front connecting device 12, which includes the aforesaid adjusting element 28, is connected to the second rail 34 via the mounting hole 46. The first rear connecting device 24, which includes the aforesaid locking element 30, is arranged at the rear portion 20b of the second rail 34.

[0026] Referring to FIG. 3 and FIG. 4a, the first front connecting device 12 includes a first unit 48, a second unit 50, an engaging element 52, and a disengaging el-

ement 54, in addition to the adjusting element 28.

[0027] The first unit 48 includes a main body 56, a front wall 58 located at a front portion of the main body 56, and a sidewall 60 located at a lateral side of the main body 56.

[0028] The main body 56 of the first unit 48 has at least one transverse guiding portion 62 which is substantially parallel to the front wall 58. The at least one transverse guiding portion 62 of the first unit 48 may be formed as one or more transverse guiding holes. Here, the at least one transverse guiding portion 62 of the first unit 48 is implemented by a first transverse guiding hole 64a and a second transverse guiding hole 64b by way of example. In an embodiment which is not shown, however, the at least one transverse guiding portion 62 of the first unit 48 is one or more protruding blocks. It should be noted that the "transverse" direction refers to a direction perpendicular to the longitudinally extending main body 42 of the first rail 32 or the longitudinally extending main body 44 of the second rail 34.

[0029] In one preferred embodiment, the main body 56 of the first unit 48 further includes at least one transverse guiding groove between the first transverse guiding hole 64a and the front wall 58. Here, the at least one transverse guiding groove is implemented by a first transverse guiding groove 66a and a second transverse guiding groove 66b, wherein the first transverse guiding groove 66a and the second transverse guiding groove 66b are arranged substantially in a line. In addition, the main body 56 of the first unit 48 is provided with an aperture 68 between the first transverse guiding hole 64a and the second transverse guiding hole 64b. Moreover, the front wall 58 of the first unit 48 is provided with a mounting portion (e.g., mounting holes 70) which, together with a mounting element (not shown), allows the first unit 48 to be mounted to the drawer 10, and yet the mounting method of the first unit 48 is not limited to the above. The sidewall 60 of the first unit 48 includes a threaded hole 72.

[0030] The second unit 50 includes a main body 74, a first sidewall 76 located at a lateral side of the main body 74, and a second sidewall 78 located at the opposite lateral side of the main body 74 and facing the first sidewall 76.

[0031] The main body 74 of the second unit 50 corresponds in position to the main body 56 of the first unit 48. The main body 74 of the second unit 50 has at least one transverse guiding portion 80 corresponding in position to and located at the transverse guiding portion 62 of the first unit 48 so as to be guided by the transverse guiding portion 62 of the first unit 48. Here, the at least one transverse guiding portion 80 of the second unit 50 is implemented by a first protruding block 82a and a second protruding block 82b by way of example. Thus, with the first protruding block 82a and the second protruding block 82b of the second unit 50 corresponding in position to the first transverse guiding hole 64a and the second transverse guiding hole 64b of the first unit 48 respectively, the second unit 50 can slide smoothly relative to

the first unit 48. In an embodiment which is not shown, however, the at least one transverse guiding portion 80 of the second unit 50 is one or more transverse guiding holes corresponding in position to one or more protruding blocks (i.e., the at least one transverse guiding portion 62) of the first unit 48.

[0032] In one preferred embodiment, the main body 74 of the second unit 50 further includes a transverse hole 84 whose dimensions, in particular the transverse width, are greater than those of the aperture 68 of the first unit 48. A first connecting element 86 is passed through the transverse hole 84 of the second unit 50 and the aperture 68 of the first unit 48 to connect the first unit 48 and the second unit 50. Moreover, the first connecting element 86, once positioned in the transverse hole 84 and the aperture 68, serves to guide and facilitate the sliding action of the second unit 50 relative to the first unit 48.

[0033] Preferably, a front portion of the main body 74 of the second unit 50 further includes an edge 88 to be pressed against the first transverse guiding groove 66a and the second transverse guiding groove 66b of the first unit 48. The edge 88 of the main body 74 of the second unit 50 includes a protruding portion 90 for indicating the displacement distance of the second unit 50 relative to the first unit 48. In addition, the first sidewall 76 of the second unit 50 includes a hanging hole 92, and the second sidewall 78 of the second unit 50 has a wall hole 94.

[0034] The engaging element 52 is connected to the second unit 50. The engaging element 52 has a main body 96, an engaging portion 98 located at a lateral side of the main body 96, an elastic arm 100 located at the opposite lateral side of the main body 96, and a slot 102 in the main body 96. In one preferred embodiment, the engaging element 52 is pivotally connected to the second unit 50 via a second connecting element 104. Thus, when subjected to a rotating force, the engaging element 52 can be pivoted relative to the second unit 50 by a predetermined angle.

[0035] At least a portion of the engaging portion 98 is located and mounted in the mounting hole 46 of the second rail 34 (as can be seen more clearly in FIG. 5b). More specifically, when the engaging element 52 is pivotally connected to the main body 74 of the second unit 50, the engaging portion 98 of the engaging element 52 corresponds in position to the wall hole 94 in the second sidewall 78 of the second unit 50 and can be adjusted in position by means of the adjusting element 28. The engaging portion 98 of the engaging element 52, once extending through the wall hole 94 of the second unit 50, can be engaged in the mounting hole 46 of the second rail 34 to connect the first front connecting device 12 to the second rail 34.

[0036] In one preferred embodiment, the engaging portion 98 of the engaging element 52 has a step-like structure to adapt to mounting errors between the first front connecting device 12 and the mounting hole 46 of the second rail 34. For example, if a first mounting error (or a first distance error) exists between the engaging

portion 98 of the engaging element 52 and the mounting hole 46 of the second rail 34, the first front connecting device 12 can be mounted in the mounting hole 46 of the second rail 34 via a first stage of the step-like structure. Similarly, if a second mounting error (or a second distance error) exists between the engaging portion 98 of the engaging element 52 and the mounting hole 46 of the second rail 34, the first front connecting device 12 can be mounted in the mounting hole 46 of the second rail 34 via a second stage of the step-like structure. It should be understood, however, that the engaging portion 98 of the engaging element 52 may adapt to the mounting errors between the first front connecting device 12 and the mounting hole 46 of the second rail 34 in ways other than described above. The elastic arm 100 extends from a portion of the main body 96 of the engaging element 52 and is located on the lateral side of the main body 96 that is opposite the engaging portion 98. The elastic arm 100 is generally U-shaped and has an end portion to contact against the second unit 50.

[0037] The disengaging element 54 is pivotally connected to the main body 74 of the second unit 50 via a third connecting element 106. The disengaging element 54 has a disengaging portion 108 located in the slot 102 of the main body 96 of the engaging element 52. The disengaging portion 108 is substantially an elliptic cylinder (but is not limited thereto) and is in contact with the wall surface of the slot 102.

[0038] The adjusting element 28 has an adjusting portion 110 and a screw rod 112. The screw rod 112 is connected to the first unit 48 and the second unit 50. More specifically, the screw rod 112 of the adjusting element 28 is threadedly connected to the threaded hole 72 of the first unit 48, and the second unit 50 hangs on the neck 114 of the screw rod 112 via the hanging hole 92.

[0039] Referring to FIG. 4a and FIG. 4b, the first unit 48 is marked with a plurality of characteristic marks, including a first characteristic mark K1, a second characteristic mark K2, a third characteristic mark K3, a fourth characteristic mark K4, and a fifth characteristic mark K5. If a mounting error S1 (distance error) exceeding an allowable range exists between the engaging portion 98 of the engaging element 52 of the first front connecting device 12 and the mounting hole 46 of the second rail 34 of the first slide rail assembly 16 (at which time the protruding portion 90 of the second unit 50 is located at the third characteristic mark K3, indicating a first position of the second unit 50), the engaging portion 98 of the engaging element 52 of the first front connecting device 12 cannot extend, let alone be mounted, into the mounting hole 46 of the second rail 34 of the first slide rail assembly 16 without the operator rotating the adjusting portion 110 of the adjusting element 28. In other words, unless the adjusting portion 110 of the adjusting element 28 is rotated, the first front connecting device 12 in this position cannot be connected to the second rail 34 of the first slide rail assembly 16.

[0040] With reference to FIG. 5a, when the adjusting

portion 110 of the adjusting element 28 is rotated, the second unit 50 is displaced relative to the second rail 34 of the first slide rail assembly 16. As the engaging element 52 is connected to the second unit 50, the distance between the engaging portion 98 of the engaging element 52 and the mounting hole 46 of the second rail 34 is adjusted with the displacement of the second unit 50. More specifically, when the adjusting portion 110 of the adjusting element 28 is rotated (at which time the protruding portion 90 of the second unit 50 is displaced from the third characteristic mark K3 to the fifth characteristic mark K5, meaning that the second unit 50 is moved from the first position to a second position), the second unit 50 is displaced stably toward the first slide rail assembly 16 due to, referring back to FIG. 3, the guiding relationships between the first protruding block 82a of the second unit 50 and the first transverse guiding hole 64a of the first unit 48, the guiding relationship between the second protruding block 82b of the second unit 50 and the second transverse guiding hole 64b of the first unit 48, the guiding relationship between the first connecting element 86 and the transverse hole 84, and the guiding relationship between the edge 88 of the second unit 50 and the first and second transverse guiding grooves 66a, 66b of the first unit 48. When displaced along with the second unit 50, the engaging portion 98 of the engaging element 52 is first pressed against a sidewall of the second rail 34 of the first slide rail assembly 16. As a result, the engaging element 52 is pivoted by the predetermined angle due to the second connecting element 104. In the meantime, the elastic arm 100 of the engaging element 52 is compressed and stores an elastic energy.

[0041] Referring to FIG. 5b, when the first front connecting device 12 is further moved such that the engaging portion 98 of the engaging element 52 corresponds in position to the mounting hole 46 of the second rail 34 of the first slide rail assembly 16, the elastic energy stored in the elastic arm 100 is released, and the engaging portion 98 of the engaging element 52 springs into and is thereby mounted in the mounting hole 46 of the second rail 34. Thus, the problem associated with the mounting error S1 is solved, allowing the first front connecting device 12 to be securely connected to the second rail 34 of the first slide rail assembly 16.

[0042] As shown in FIG. 5a and FIG. 5b, once the second unit 50 is displaced relative to the second rail 34 of the first slide rail assembly 16 in response to the rotation of the adjusting portion 110 of the adjusting element 28, the engaging portion 98 of the engaging element 52 can be displaced relative to the mounting hole 46 of the second rail 34 of the first slide rail assembly 16.

[0043] Referring to FIG. 6a and FIG. 6b, when it is desired to remove the engaging portion 98 of the engaging element 52 from the position shown in FIG. 5b, i.e., from the mounting hole 46 of the second rail 34 of the first slide rail assembly 16, the operator only has to pivot the disengaging element 54 in such a way that the disengaging portion 108 of the disengaging element 54 is rotated

and pressed against the wall surface of the slot 102 of the engaging element 52, and the disengaging portion 108 will pivot the engaging element 52 by the predetermined angle by means of the wall surface of the slot 102, allowing the engaging portion 98 of the engaging element 52 to displace relative to and separate from the second rail 34 (FIG. 6b showing the engaging portion 98 of the engaging element 52 retracted into the second unit 50 after being rotated). Thus, the connection between the first front connecting device 12 and the second rail 34 of the first slide rail assembly 16 is cut off.

[0044] As shown in FIG. 7, the first rear connecting device 24 includes a main body 116 and a movable element 118 in addition to the locking element 30.

[0045] The main body 116 includes a supporting portion 120 and a transverse portion 122 substantially perpendicularly connected to the supporting portion 120. In one preferred embodiment, the supporting portion 120 of the main body 116 includes a first vertical wall 112a and a second vertical wall 112b. The first vertical wall 112a and the second vertical wall 112b are respectively and substantially perpendicularly connected to two opposite lateral sides of the transverse portion 122 of the main body 116. The first rear connecting device 24 includes at least one connecting hole 124 through which a connecting element (not shown) is passed to mount the first rear connecting device 24 to the rear portion 20b of the second rail 34 of the first slide rail assembly 16 (see FIG. 1). Alternatively, the first rear connecting device 24 may be integrally formed with the rear portion 20b of the second rail 34 of the first slide rail assembly 16.

[0046] In one preferred embodiment, the transverse portion 122 of the main body 116 includes a plurality of fixing portions 126 which are arranged at intervals. Each fixing portion 126 of the transverse portion 122 of the main body 116 is a recess 128. In addition, each of the first vertical wall 112a and the second vertical wall 112b has a through hole 130, and the through holes 130 correspond in position to each other.

[0047] The locking element 30 is pivotally connected to the supporting portion 120 of the main body 116. The locking element 30 includes a head 132 and a locking rod 134 connected to the head 132, wherein the locking rod 134 has a contact portion 136. The locking rod 134 of the locking element 30 is pivotally provided in the through holes 130 of the first vertical wall 112a and the second vertical wall 112b.

[0048] The movable element 118 is movably provided between the main body 116 and the locking element 30. The movable element 118 includes a first plate portion 138a and a second plate portion 138b perpendicular to the first plate portion 138a. Preferably, the first plate portion 138a of the movable element 118 includes a fixing portion 140 corresponding in position to one of the fixing portions 126 of the transverse portion 122 of the main body 116. The fixing portion 140 of the first plate portion 138a is a rib 142 corresponding in structure to each recess 128 in the transverse portion 122 of the main body

116. Moreover, the movable element 118 has a width L1 less than a width L2 between the first vertical wall 112a and the second vertical wall 112b of the main body 116. This allows the movable element 118 to move between the first vertical wall 112a and the second vertical wall 112b of the main body 116.

[0049] Referring to FIG. 8a, when the head 132 of the locking element 30 is rotated to a first position, the contact portion 136 of the locking rod 134 of the locking element 30 is pressed against the first plate portion 138a of the movable element 118 such that the rib 142 of the first plate portion 138a of the movable element 118 is engaged in one of the recesses 128 of the transverse portion 122 of the main body 116. It can be known from the above that, by means of the locking element 30, the first plate portion 138a of the movable element 118 can be fixed at the mounting position to enable alignment of the drawer 10 (see FIG. 1), i.e., allowing the back panel of the drawer 10 to align with and be mounted to the first plate portion 138a.

[0050] Referring to FIG. 8b, when mounting errors prevent the drawer 10 from being aligned with the first plate portion 138a of the movable element 118, the operator can rotate the head 132 of the locking element 30 from the first position to a second position so that the contact portion 136 of the locking rod 134 of the locking element 30 is no longer pressed against the first plate portion 138a of the movable element 118. This allows the rib 142 of the first plate portion 138a of the movable element 118 to disengage from the one of the recesses 128 of the transverse portion 122 of the main body 116, and consequently the movable element 118 to displace relative to the main body 116. As shown in FIG. 9, the movable element 118, which includes the first plate portion 138a, can be adjusted in position to adapt to mounting errors between the drawer 10 and the first plate portion 138a of the movable element 118, thereby eliminating the difficulty of alignment therebetween.

[0051] Referring to FIG. 10, once the position of a positioning hole 146 in the back panel 144 of the drawer 10 is determined, the operator can operate the locking element 30 so that, by adjusting the position of the movable element 118, which includes the first plate portion 138a, the first plate portion 138a is aligned with the positioning hole 146 in the back panel 144 of the drawer 10 to eliminate mounting errors between the back panel 144 of the drawer 10 and the first plate portion 138a of the movable element 118.

[0052] FIG. 11a and FIG. 11b show the second embodiment of the rear connecting device. This embodiment is different from the embodiment in FIG. 8a and FIG. 8b only in that each fixing portion of the transverse portion 202 of the main body 200 is a rib 204, and that the fixing portion of the first plate portion 208 of the movable element 206 is a recess 210. As the second embodiment has the same technical effects as the embodiment in FIG. 8a and FIG. 8b, further description is omitted here for brevity.

[0053] FIG. 12a and FIG. 12b show the third embodiment of the rear connecting device. This embodiment is different from the embodiments in FIGS. 8a, 8b and FIGS. 11a, 11b only in that each fixing portion 304 of the transverse portion 302 of the main body 300 is a flat surface (without any rib or recess), and that the fixing portion 310 of the first plate portion 308 of the movable element 306 is also a flat surface (without any rib or recess). The third embodiment has substantially the same technical effects as the embodiments in FIGS. 8a, 8b and FIGS. 11a, 11b.

[0054] More specifically, referring to FIG. 12a, when the head 314 of the locking element 312 is rotated to a first position, the contact portion 318 of the locking rod 316 is pressed against the first plate portion 308 of the movable element 306; as a result, the movable element 306 is fixed to the main body 300 by friction. Referring to FIG. 12b, once the head 314 of the locking element 312 is rotated from the first position to a second position, the contact portion 318 of the locking rod 316 is no more pressed against the first plate portion 308 of the movable element 306, and the movable element 306 is therefore allowed to displace relative to the main body 300.

[0055] While the present invention has been disclosed through the foregoing preferred embodiments, it is understood that the embodiments are not intended to restrict the scope of the present invention. The scope of the present invention is defined by the appended claims.

Claims

1. A front connecting device (12) applicable to a slide rail assembly (16), **characterized in that** the front connecting device (12) comprises:

a first unit (48) having at least one transverse guiding portion (62);
 a second unit (50) having at least one transverse guiding portion (80) located at the transverse guiding portion (62) of the first unit (48);
 an engaging element (52) connected to the second unit (50), the engaging element (52) having an engaging portion (98); and
 an adjusting element (28) having an adjusting portion (110) and a screw rod (112), the screw rod (112) being connected to the first unit (48) and the second unit (50);
 wherein the second unit (50) is displaceable in response to rotation of the adjusting portion (110) of the adjusting element (28), thereby enabling displacement of the engaging portion (98) of the engaging element (52).

2. The front connecting device (12) of claim 1, wherein the at least one transverse guiding portion (62) of the first unit (48) comprises a transverse guiding hole (64a, 64b), and the at least one transverse guiding portion (80) of the second unit (50) comprises a pro-

truding block (82a, 82b).

3. The front connecting device (12) of claim 1, wherein the second unit (50) further comprises a first sidewall (76) having a hanging hole (92); the first unit (48) further comprises a sidewall (60) having a threaded hole (72), the screw rod (112) of the adjusting element (28) being threadedly connected to the threaded hole (72) while the second unit (50) hangs on a neck (114) of the screw rod (112) via the hanging hole (92); and the second unit (50) further comprises a second sidewall (78) opposite the first sidewall (76), the second sidewall (78) having a wall hole (94), the engaging portion (98) of the engaging element (52) corresponding in position to the wall hole (94). 5 10 15
4. The front connecting device (12) of claim 1, wherein the engaging element (52) further comprises an elastic arm (100) and a slot (102), and the front connecting device (12) further comprises a disengaging element (54) pivotally connected to the second unit (50), the disengaging element (54) having a disengaging portion (108) located in the slot (102). 20
5. A slide rail system having a front connecting device (12) as claimed in claim 1, wherein the slide rail assembly (16) comprises: 25
 - a first rail (32) having a longitudinally extending main body (42); and 30
 - a second rail (34) longitudinally slidable relative to the first rail (32), the second rail (34) having a longitudinally extending main body (44), a front portion (20a), and a mounting hole (46) adjacent to the front portion (20a); and 35

wherein the engaging portion (98) of the engaging element (52) of the front connecting device (12) is at least partially located in the mounting hole (46) of the second rail (34), and the second unit (50) is displaceable relative to the second rail (34) in response to rotation of the adjusting portion (110) of the adjusting element (28), thereby enabling displacement of the engaging portion (98) of the engaging element (52) relative to the mounting hole (46) of the second rail (34). 40 45

- 6. The slide rail system of claim 5, wherein the second unit (50) further comprises a first sidewall (76) having a hanging hole (92); the first unit (48) further comprises a sidewall (60) having a threaded hole (72), the screw rod (112) of the adjusting element (28) being threadedly connected to the threaded hole (72) while the second unit (50) hangs on a neck (114) of the screw rod (112) via the hanging hole (92); and the second unit (50) further comprises a second sidewall (78) opposite the first sidewall (76), the second sidewall (78) having a wall hole (94), the engaging 50 55

portion (98) of the engaging element (52) corresponding in position to the wall hole (94).

7. The slide rail system of claim 5, wherein the engaging element (52) further comprises an elastic arm (100), and when the adjusting portion (110) of the adjusting element (28) is rotated, the second unit (50) is displaced relative to the second rail (34), the engaging portion (98) of the engaging element (52) if not yet corresponding in position to the mounting hole (46) of the second rail (34) is pressed against a sidewall of the second rail (34) and pivoted by a predetermined angle such that the elastic arm (100) stores an elastic energy, and the engaging portion (98) of the engaging element (52), once corresponding in position to the mounting hole (46), enters the mounting hole (46) due to the elastic energy released by the elastic arm (100); and wherein the engaging element (52) further comprises a slot (102), the front connecting device (12) further comprises a disengaging element (54) pivotally connected to the second unit (50), the disengaging element (54) having a disengaging portion (108) located in the slot (102), and when the disengaging element (54) is pivoted, the disengaging portion (108) of the disengaging element (54) drives the engaging element (52) via the slot (102) and thereby pivots the engaging element (52) such that the engaging portion (98) of the engaging element (52) is displaced relative to the second rail (34) and separates from the mounting hole (46). 5 10 15 20 25 30 35
8. The slide rail system of claim 5, wherein the second rail (34) further has a rear portion (20b) opposite the front portion (20a), the rear portion (20b) being provided with a rear connecting device (24), the rear connecting device (24) comprising:
 - a main body (116, 200, 300) comprising a supporting portion (120) and a transverse portion (122, 202, 302) substantially perpendicularly connected to the supporting portion (120);
 - a locking element (30, 312) pivotally connected to the supporting portion (120) of the main body (116, 200, 300), the locking element (30, 312) comprising a head (132, 314) and a locking rod (134, 316) connected to the head (132, 314), the locking rod (134, 316) having a contact portion (136, 318); and
 - a movable element (118, 206, 306) movably provided between the main body (116, 200, 300) and the locking element (30, 312), the movable element (118, 206, 306) comprising a first plate portion (138a, 208, 308) and a second plate portion (138b) substantially perpendicular to the first plate portion (138a, 208, 308);

wherein when the head (132, 314) of the locking element (30, 312) is rotated to a first position, 5 10 15 20 25 30 35 40 45 50 55

the contact portion (136, 318) of the locking rod (134, 316) is pressed against the first plate portion (138a, 208, 308) of the movable element (118, 206, 306) such that the movable element (118, 206, 306) is positioned on the main body (116, 200, 300); and
 wherein once the head (132, 314) of the locking element (30, 312) is rotated from the first position to a second position, the contact portion (136, 318) of the locking rod (134, 316) is no more pressed against the first plate portion (138a, 208, 308) of the movable element (118, 206, 306), and the movable element (118, 206, 306) is therefore allowed to be displaced relative to the main body (116, 200, 300).

locking rod (134, 316) is no more pressed against the first plate portion (138a, 208, 308) of the movable element (118, 206, 306), and the fixing portion (140, 310) of the first plate portion (138a, 208, 308) of the movable element (118, 206, 306) is therefore disengaged from the one of the fixing portions (126, 304) of the transverse portion (122, 202, 302) of the main body (116, 200, 300).

9. The slide rail system of claim 8, wherein the supporting portion (120) of the main body (116, 200, 300) comprises a first vertical wall (112a) and a second vertical wall (112b), the transverse portion (122, 202, 302) of the main body (116, 200, 300) has two opposite lateral sides respectively and substantially perpendicularly connected to the first vertical wall (112a) and the second vertical wall (112b), each of the first vertical wall (112a) and the second vertical wall (112b) has a through hole (130), the through holes (130) corresponding in position to each other, the locking rod (134, 316) of the locking element (30, 312) extends through the through holes (130) of the first vertical wall (112a) and the second vertical wall (112b), and the movable element (118, 206, 306) has a width (L1) less than a width (L2) between the first vertical wall (112a) and the second vertical wall (112b) so that the movable element (118, 206, 306) is displaceable between the first vertical wall (112a) and the second vertical wall (112b).
10. The slide rail system of claim 8, wherein the transverse portion (122, 202, 302) of the main body (116, 200, 300) comprises a plurality of fixing portions (126, 304) arranged at intervals; the first plate portion (138a, 208, 308) of the movable element (118, 206, 306) comprises a fixing portion (140, 310) corresponding in position to one of the fixing portions (126, 304) of the transverse portion (122, 202, 302) of the main body (116, 200, 300); when the head (132, 314) of the locking element (30, 312) is rotated to the first position, the contact portion (136, 318) of the locking rod (134, 316) is pressed against the first plate portion (138a, 208, 308) of the movable element (118, 206, 306) such that the fixing portion (140, 310) of the first plate portion (138a, 208, 308) of the movable element (118, 206, 306) is engaged with one of the fixing portions (126, 304) of the transverse portion (122, 202, 302) of the main body (116, 200, 300); and once the head (132, 314) of the locking element (30, 312) is rotated from the first position to the second position, the contact portion (136, 318) of the

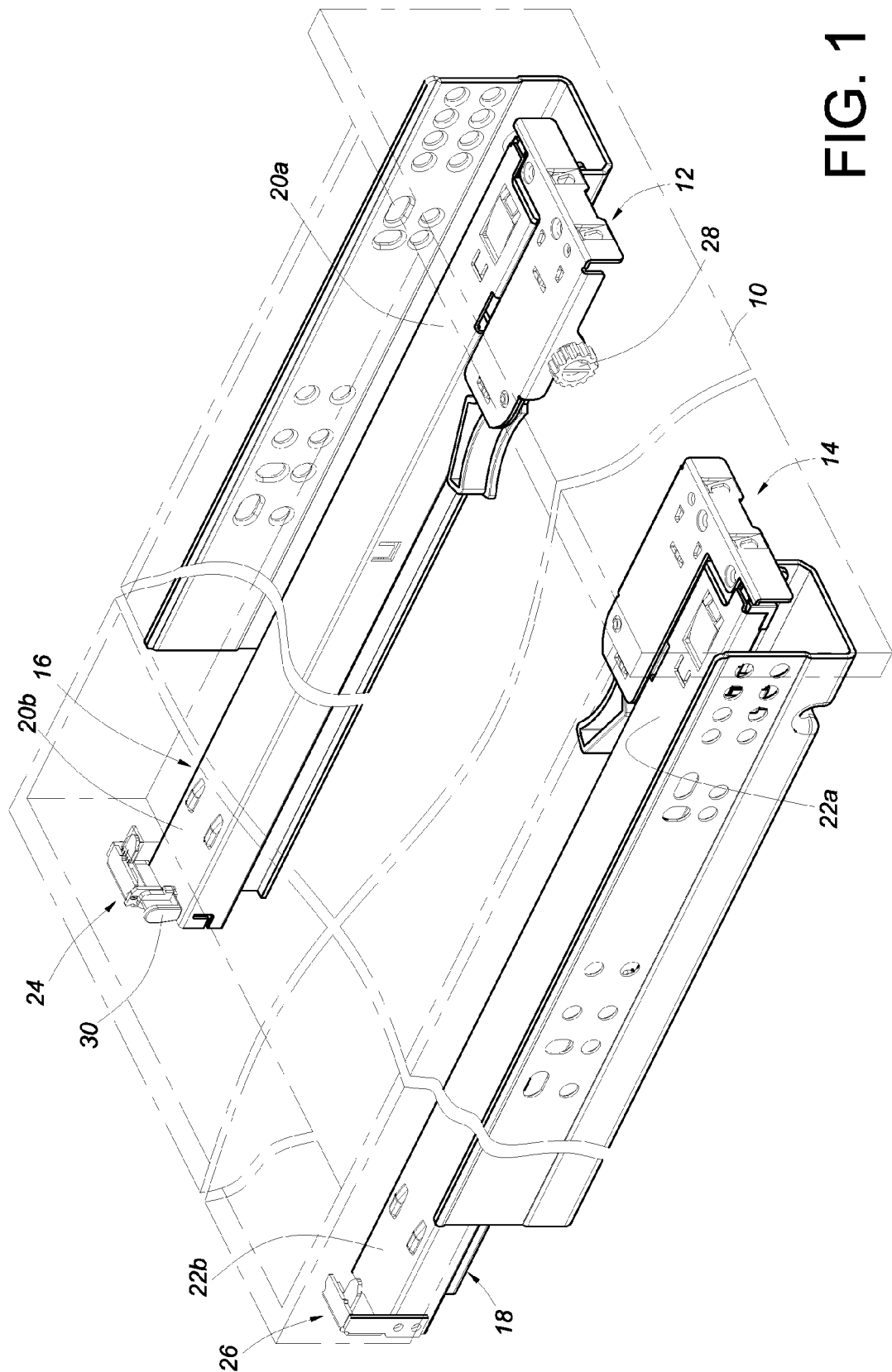


FIG. 1

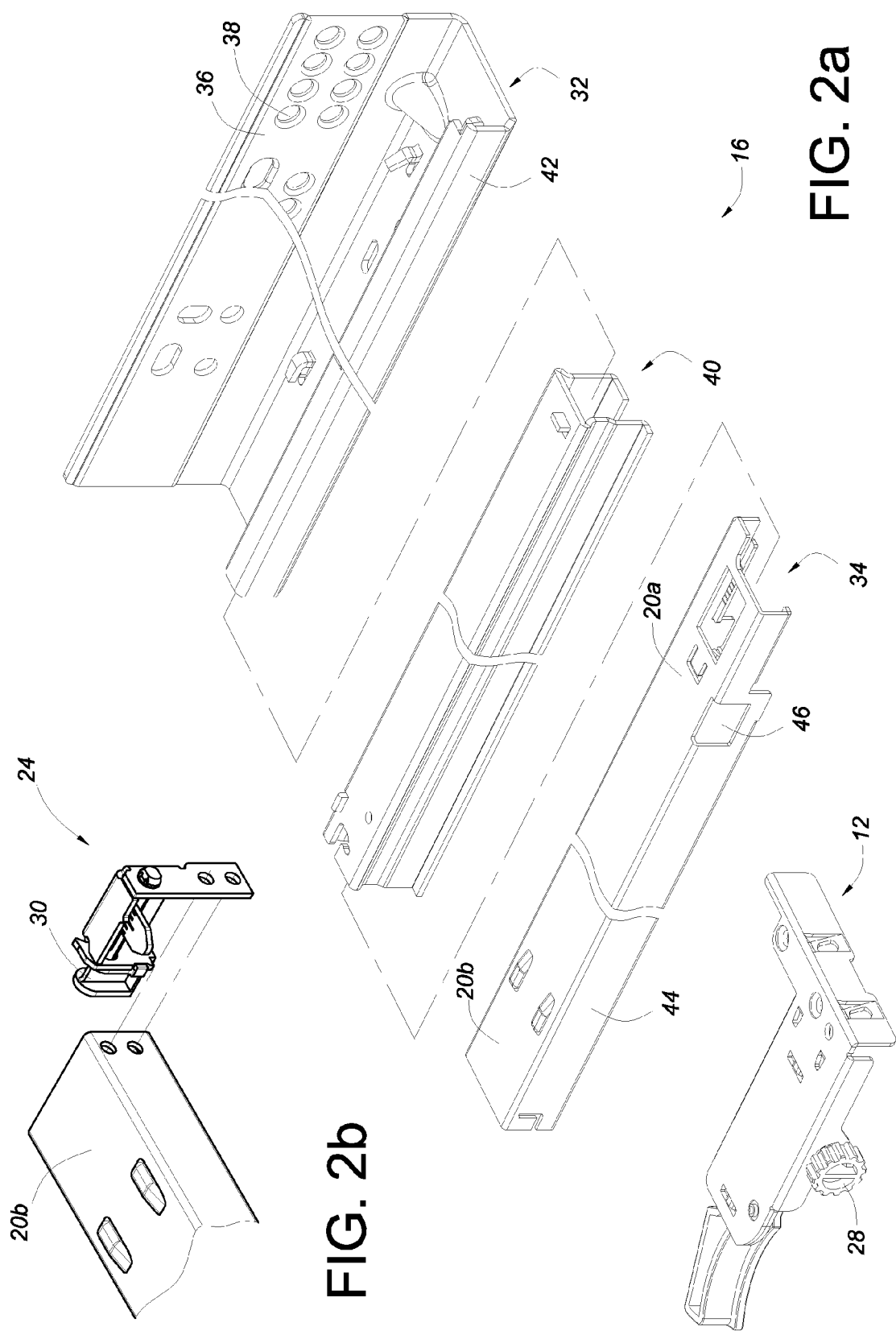


FIG. 2b

FIG. 2a

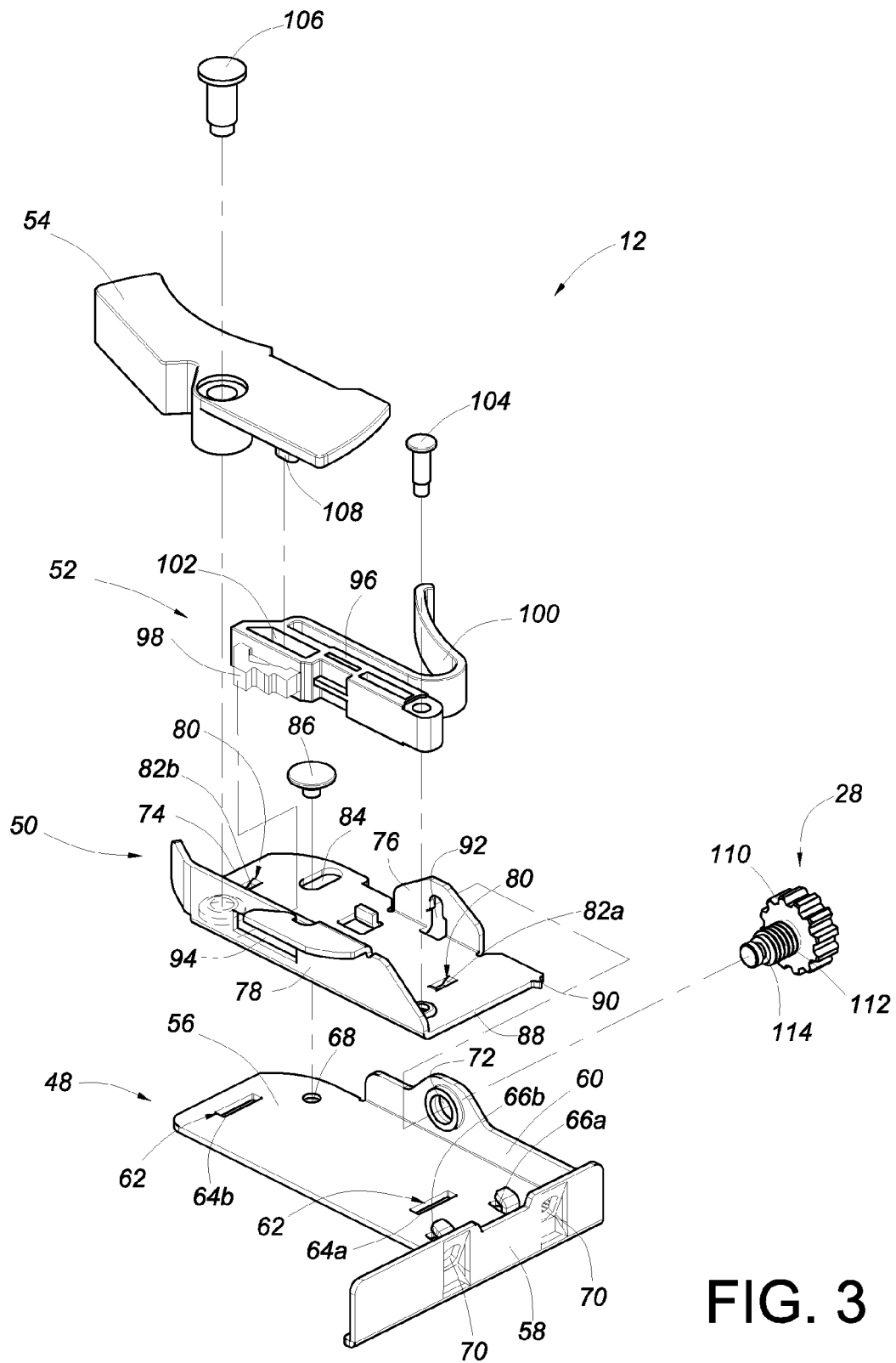
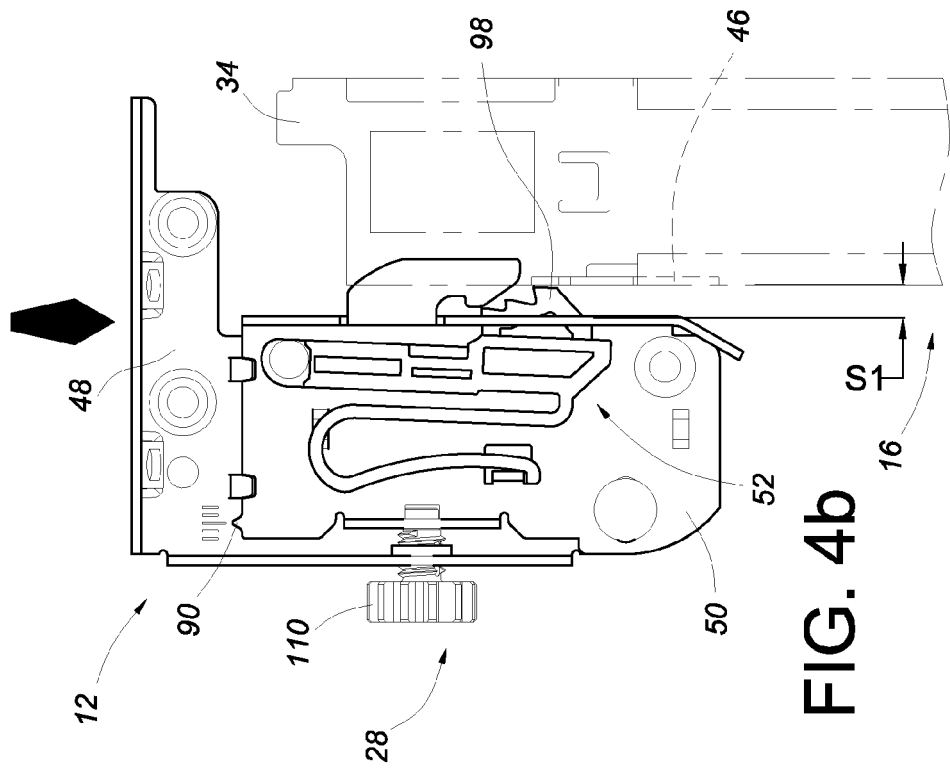
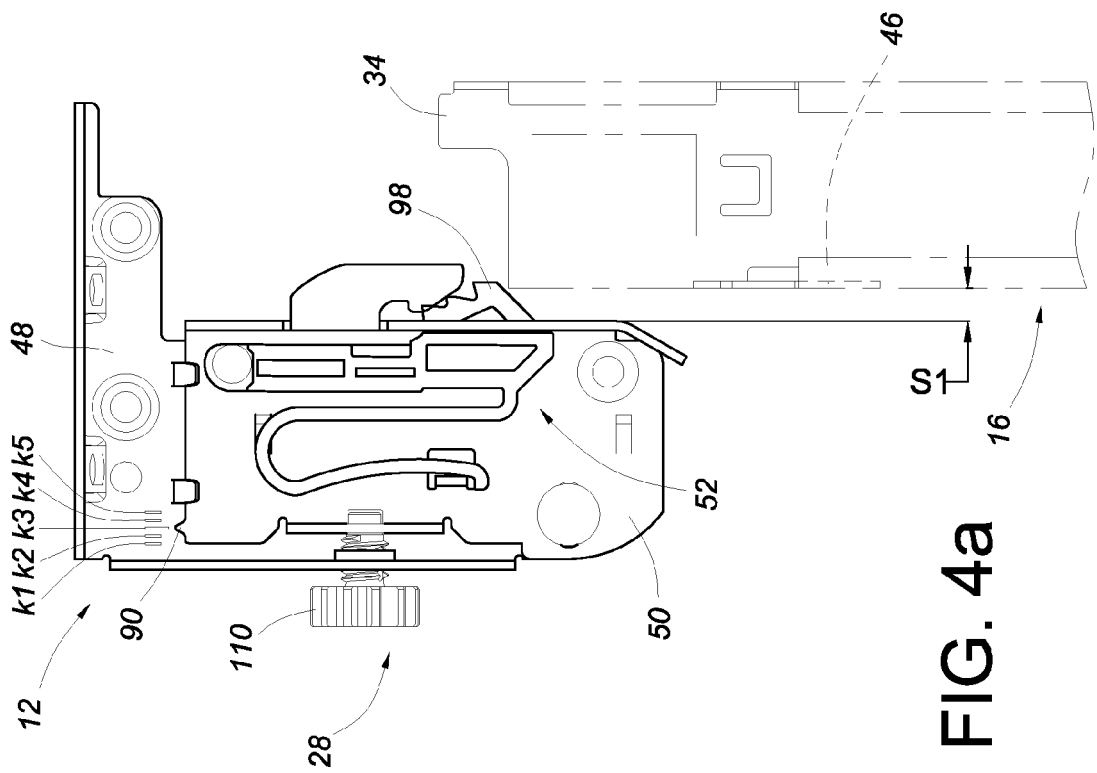


FIG. 3



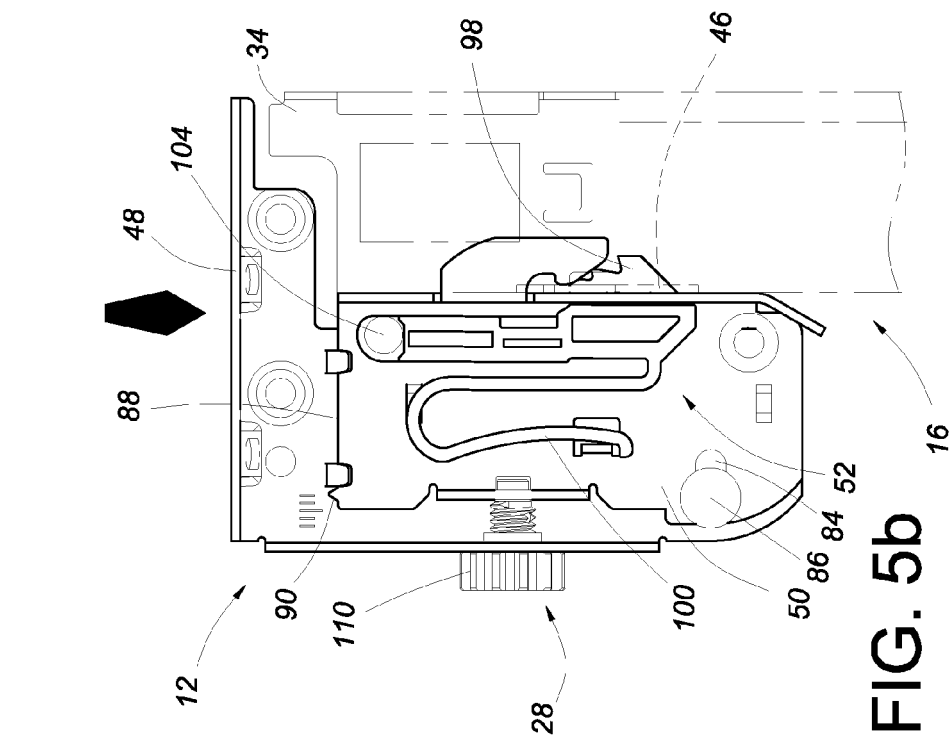


FIG. 5a

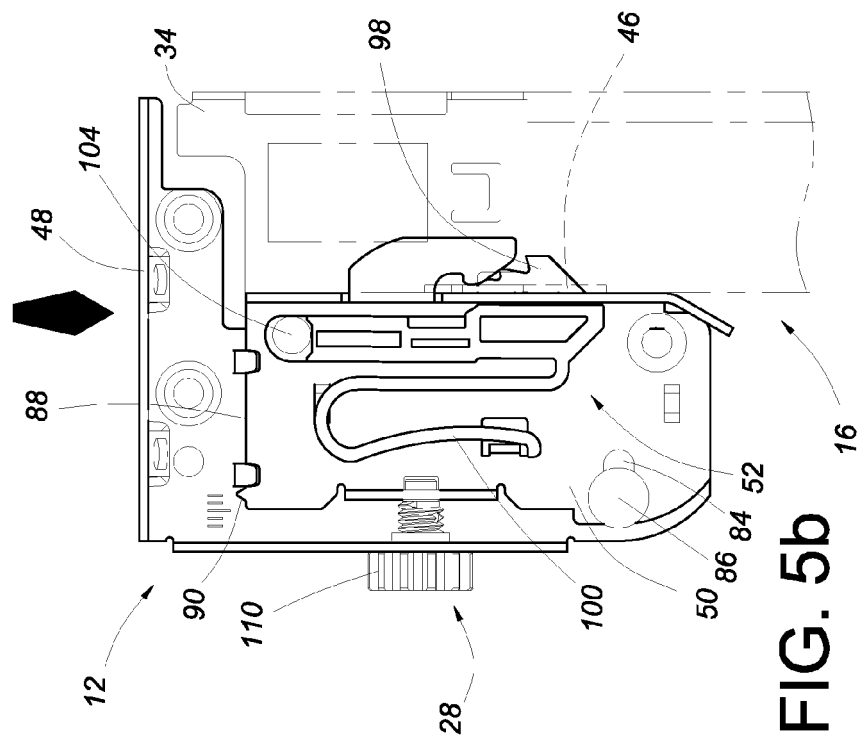


FIG. 5b

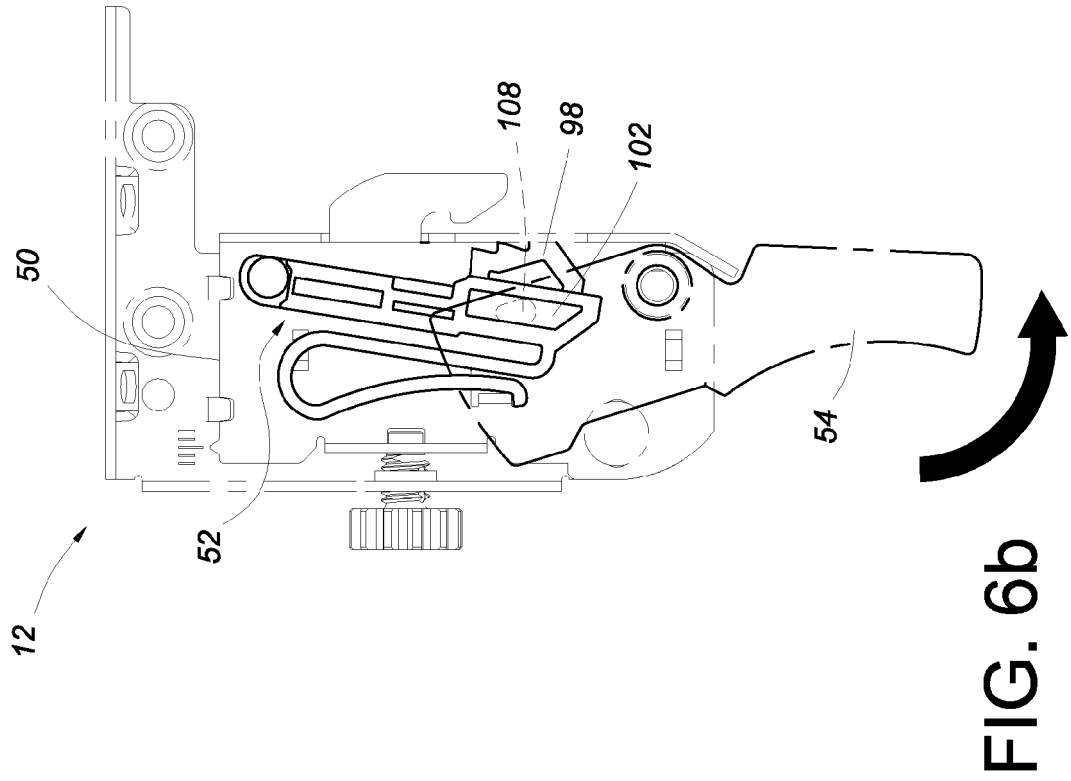


FIG. 6a

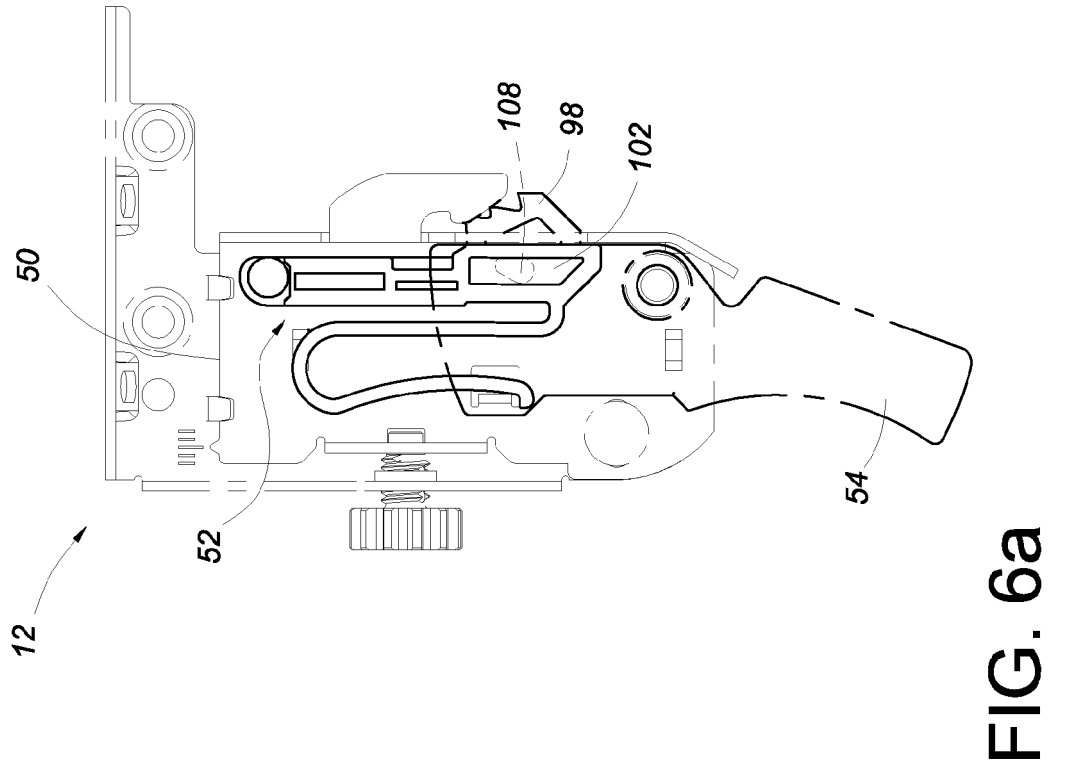
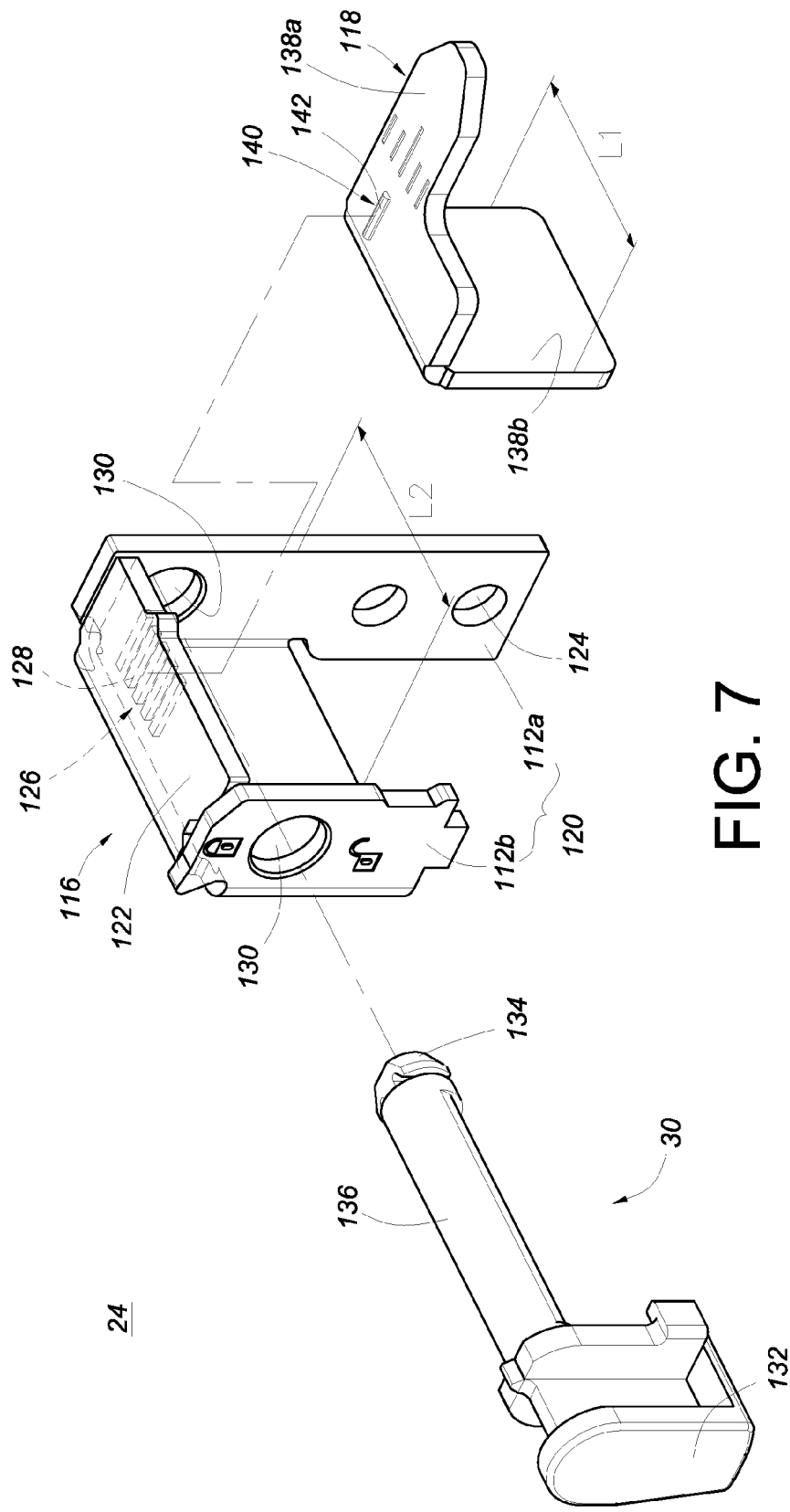


FIG. 6b



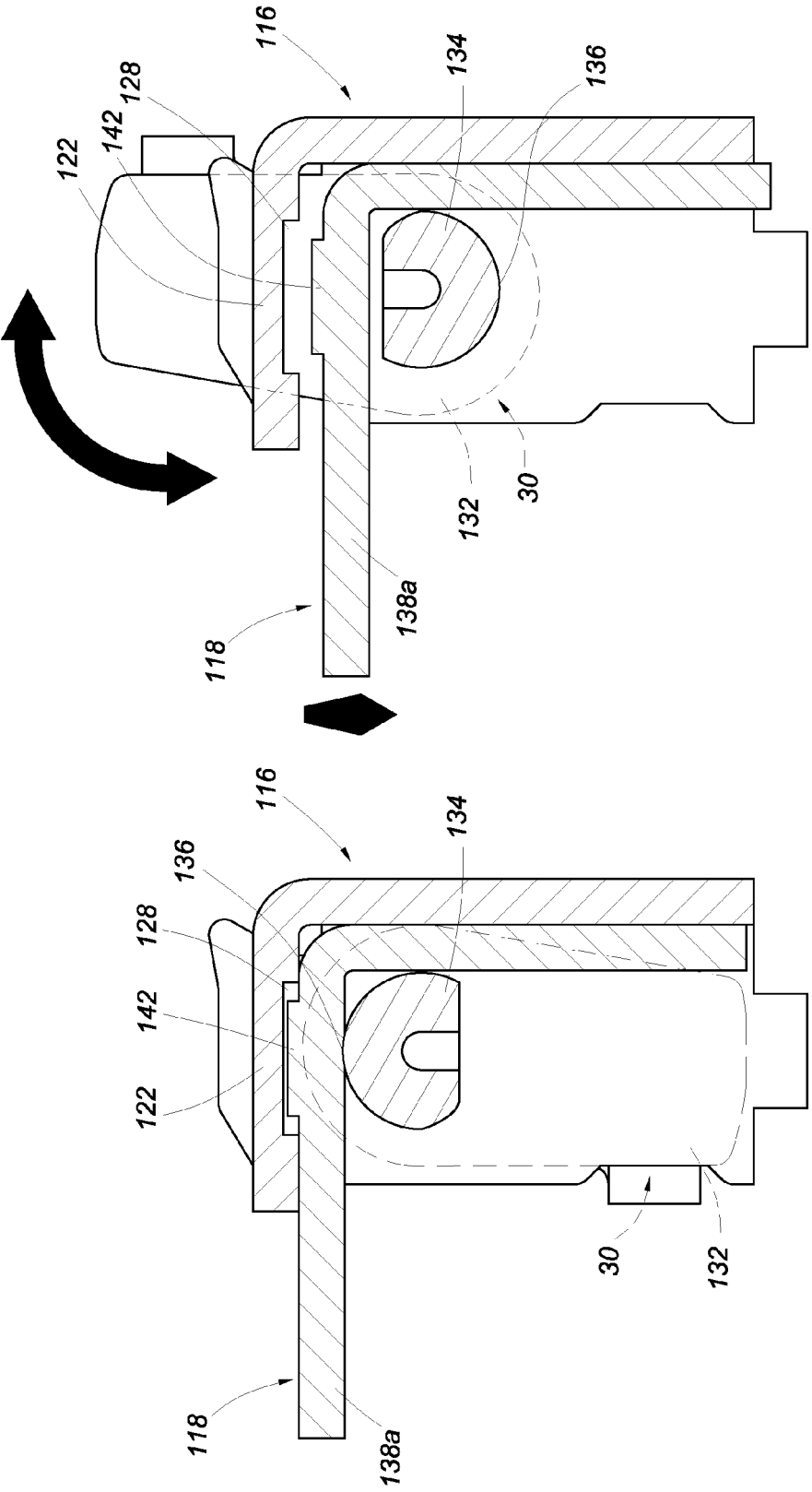


FIG. 8b

FIG. 8a

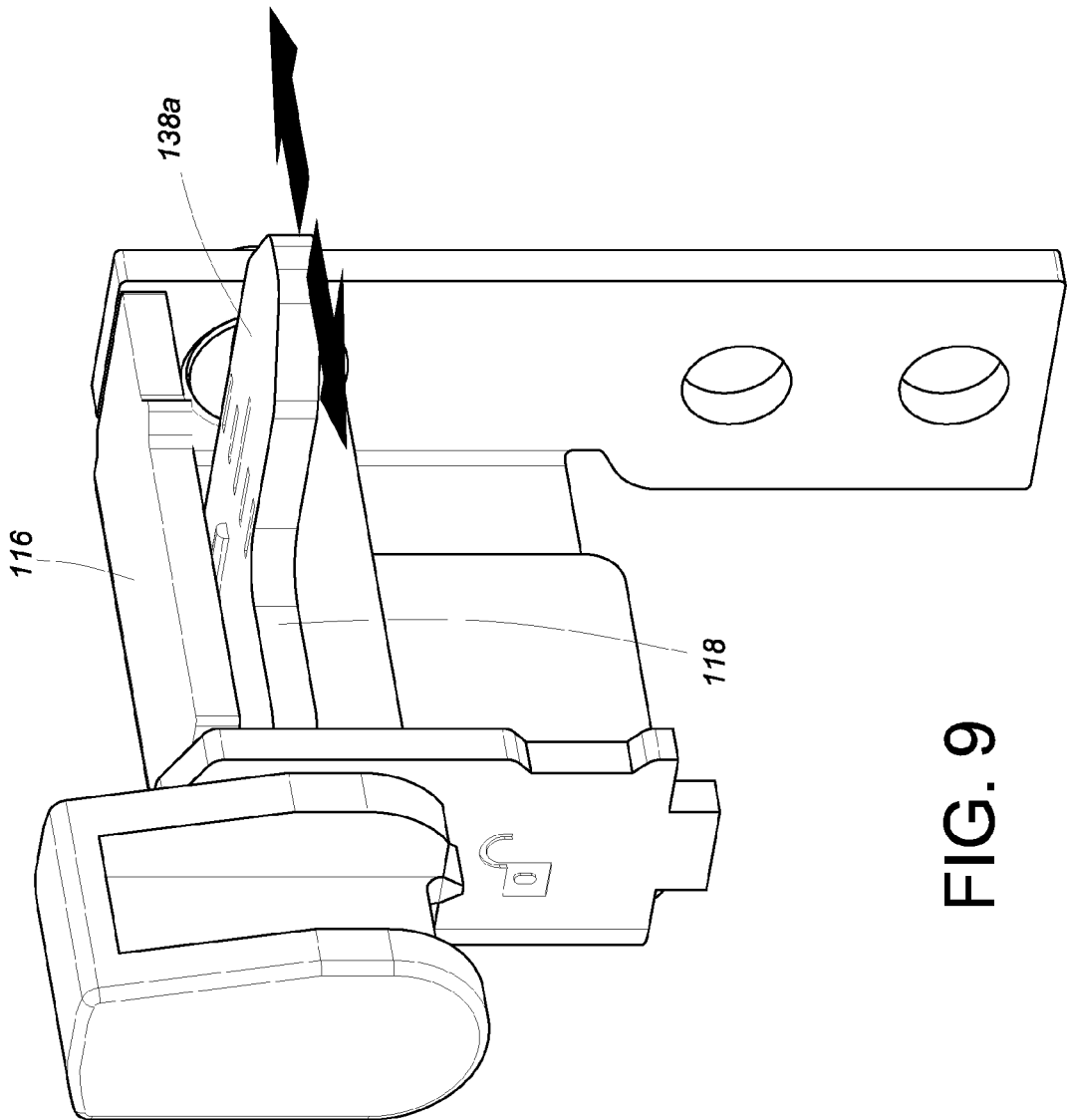


FIG. 9

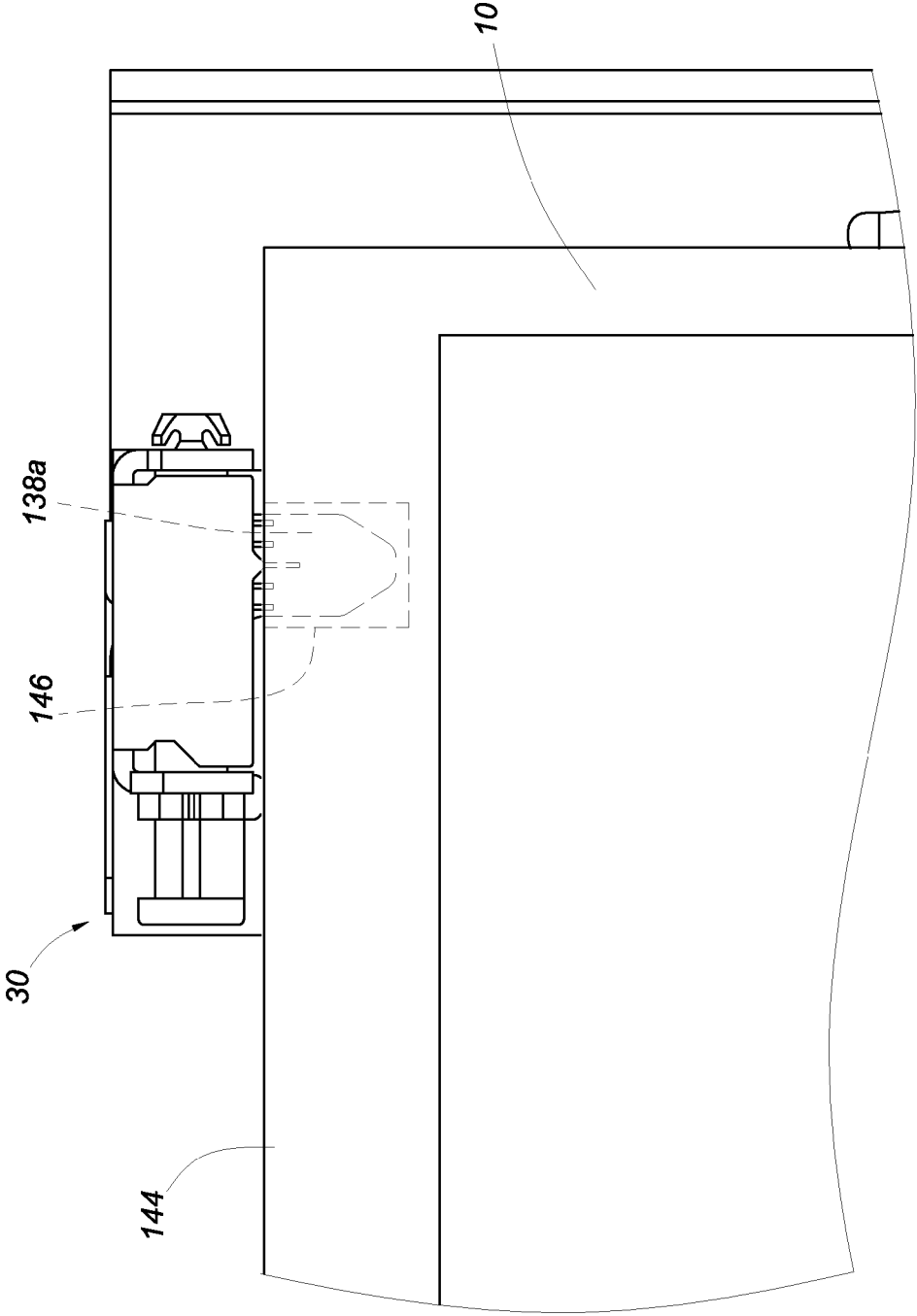


FIG. 10

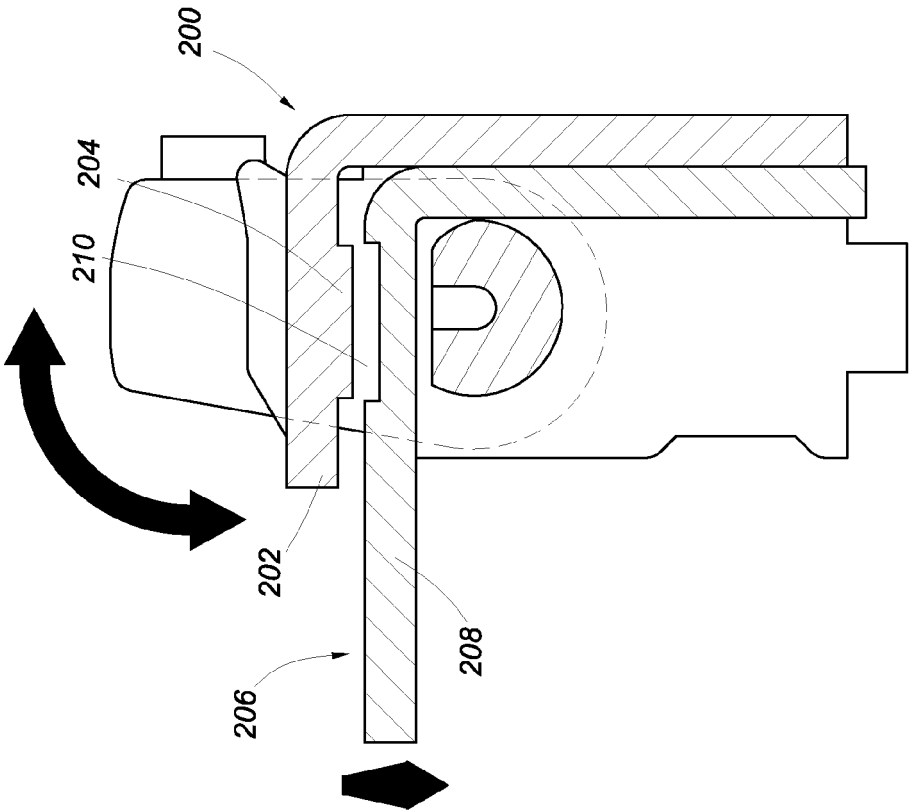


FIG. 11b

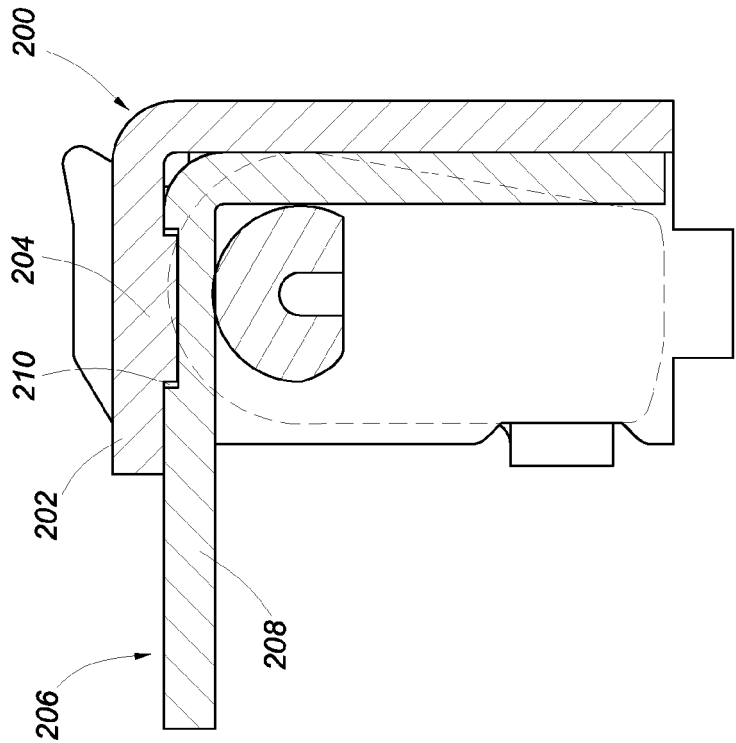


FIG. 11a

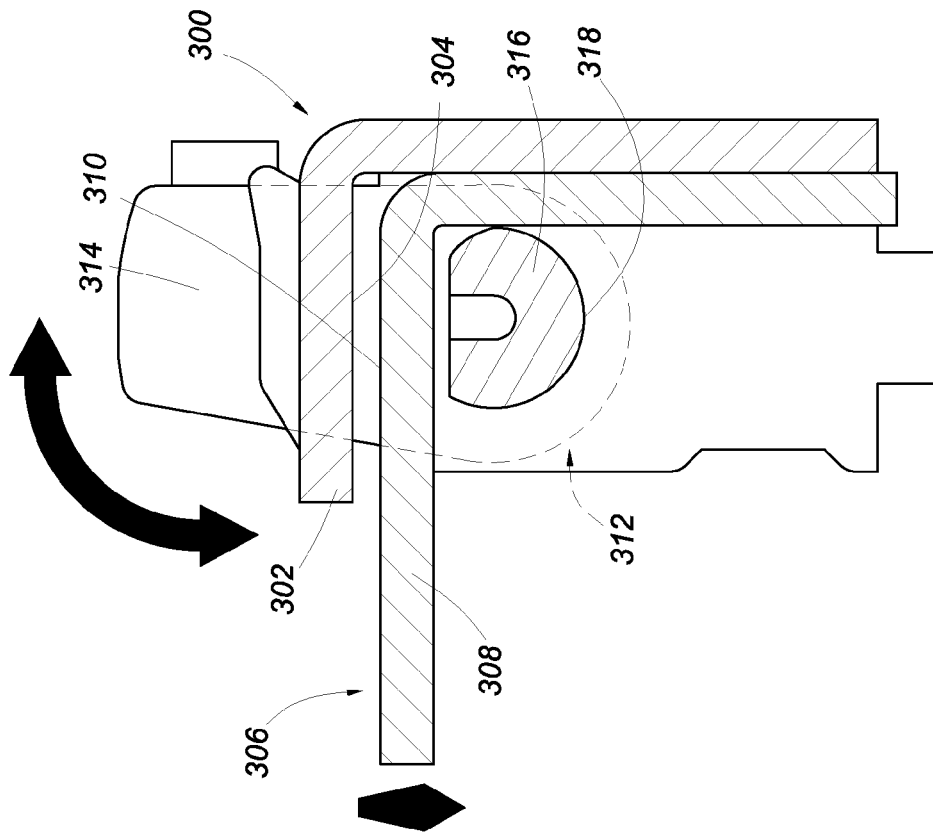


FIG. 12b

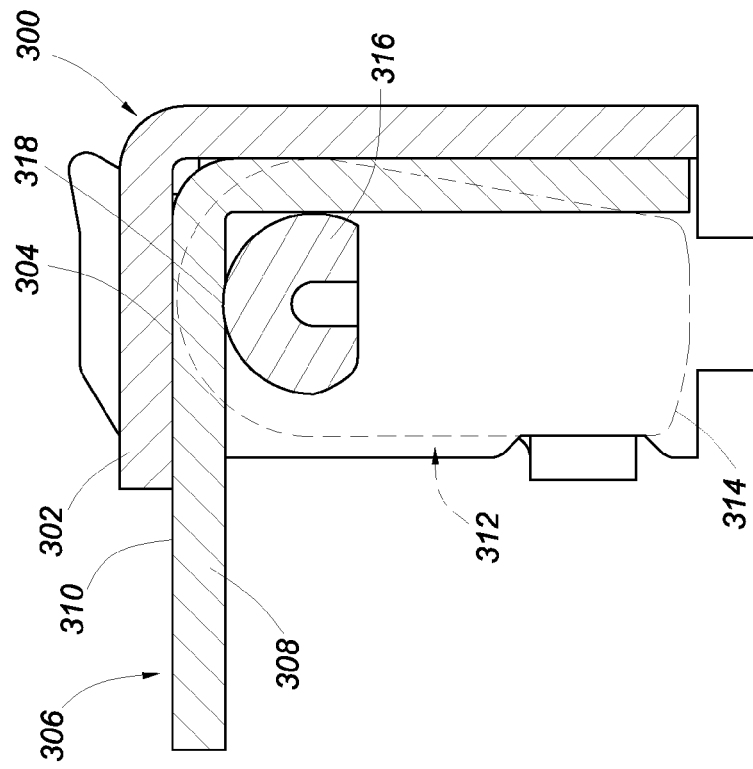


FIG. 12a



EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2009/251037 A1 (BERGER HORST [DE]) 8 October 2009 (2009-10-08) * paragraph [0080]; figures 22-24 *	1-7	INV. A47B88/00 A47B88/04
A	US 2013/293077 A1 (HAEMMERLE KURT [AT] ET AL) 7 November 2013 (2013-11-07) * figures 2a,5,10a,10b *	1,2,4,5,7	
A	DE 20 2013 003374 U1 (KESSEBOEHMER HOLDING E K [DE]) 13 June 2013 (2013-06-13) * figures 2a,4a *	1,5	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC) A47B
Place of search		Date of completion of the search	Examiner
The Hague		24 July 2014	Martinez Valero, J
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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Application Number

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-7

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

EP 14 16 3984

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-7

Front connecting device

2. claims: 8-10

Rear connecting device

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 16 3984

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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24-07-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009251037 A1	08-10-2009	AT 457667 T	15-03-2010
		CN 101420885 A	29-04-2009
		DE 202006006065 U1	23-08-2007
		EP 2012619 A2	14-01-2009
		US 2009251037 A1	08-10-2009
		WO 2007118632 A2	25-10-2007

US 2013293077 A1	07-11-2013	AT 13205 U1	15-08-2013
		AT 510905 A1	15-07-2012
		CN 103281934 A	04-09-2013
		EP 2661193 A1	13-11-2013
		JP 2014501591 A	23-01-2014
		US 2013293077 A1	07-11-2013
		WO 2012092634 A1	12-07-2012

DE 202013003374 U1	13-06-2013	DE 202013003374 U1	13-06-2013
		WO 2014166589 A1	16-10-2014

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 20120292465 A1 [0004]
- US 20120319548 A1 [0005]