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(71) Applicant: **Bauxt S.P.A.**
33053 Latisana UD (IT)

(72) Inventor: **Fornasari, Paolo**
33084 Cordenons (Pordenone) (IT)

(74) Representative: **Alagem Modiano, Lara S. et al**
Dr. Modiano & Associati SpA
Via Meravigli 16
20123 Milano (IT)

(54) **Concealed hinge for doors or windows**

(57) A concealed hinge (1) for doors or windows (2) constituted by a frame or case (3) with which at least one leaf (4) is rotatably associated, comprising a bridge (5) that is approximately U-shaped in plan view so as to form a base (6) from which a first arm and a second arm (7, 8) protrude which are approximately mutually parallel, each arm interacting selectively and respectively with first and second snap-acting means that are adapted to guide the opening of the leaf (4) from a closed condition to a first stable condition rotated through approximately 90°, followed by a second stable condition rotated through approximately 90° more, and vice versa.

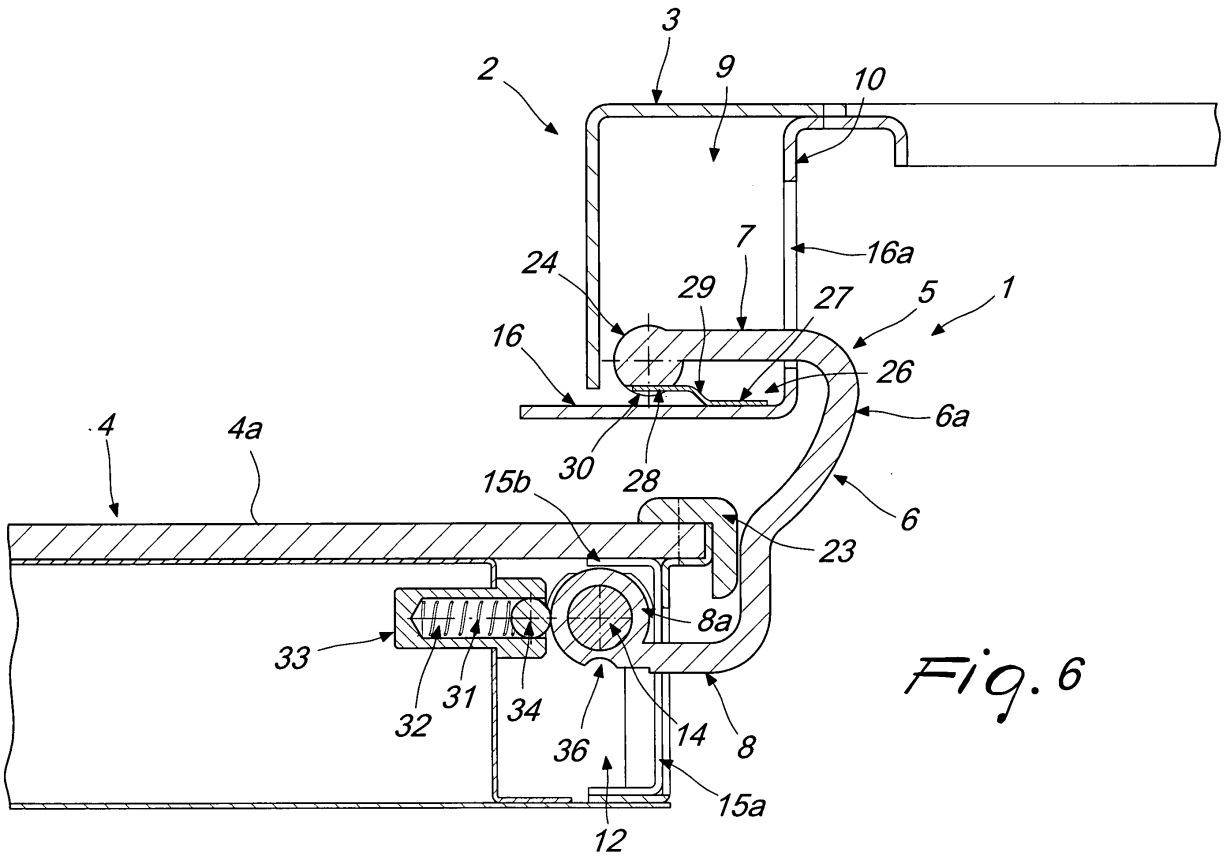

Fig. 6

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Description

[0001] The present invention relates to a concealed hinge for doors or windows, such as for example reinforced doors, shutters and windows.

[0002] Currently, in order to improve the overall aesthetics of doors or windows, particularly in the closed condition, and to make it more difficult to tamper with them, so-called concealed hinges are used which, when the door or window is in the closed condition, are completely hidden inside the frame or case of the door or window and/or within the leaf thereof.

[0003] For example, hinges are known which comprise a bridge constituted by two profiles that are approximately L-shaped in plan view and are mutually connected so as to form as a whole an approximately U-shaped plan configuration, so as to form an approximately flat base from which two approximately mutually parallel arms protrude.

[0004] One of the two arms of the bridge is fixed by means of its outer lateral surface to the lateral edge of the leaf of the door or window, while the other arm is hinged to a vertical hingeing pivot arranged within an appropriately provided seat formed in the frame or border of the door or window.

[0005] The configuration and arrangement of the seat and of the bridge are such that the latter is completely concealed within such seat when the door or window is in the closed condition.

[0006] However, this known type of hinge has a drawback: it in fact allows to turn the leaf of the door or window with respect to the frame or case by an angle that can be at the most slightly greater than 90°; therefore, this known type of hinge does not allow to arrange the leaf of the door or window parallel to the plane of arrangement of the frame or case thereof and therefore does not allow to utilize the entire space of the opening with which the door or window is associated.

[0007] As a partial solution to this drawback, EP 1835099 is also known which discloses a hinge, particularly for a door, particularly of the reinforced type, or for a shutter, which is constituted by two or more arc-like elements that are shaped approximately like an annular sector in plan view and are mutually stacked and slidingly associated, such two or more arc-like elements having means designed to limit their mutual sliding between a closed condition, in which they are approximately exactly superimposed on each other, and an open condition, in which they are mutually offset, so as to define as a whole, in plan view, an angle that can vary from approximately 180° to approximately 360°.

[0008] Two or more of such hinges can be associated with a door or shutter by fixing the arc-like element arranged in an upper position with respect to the other ones within an appropriately provided seat formed in one of the sides of a door or shutter that constitutes a door or window, and by fixing the arc-like element arranged in a lower position with respect to the other ones in an opening provided in a post of the frame or case of such door or window.

[0009] With the door or shutter in the closed condition, all the arc-like elements are exactly mutually superimposed and the hinge is completely concealed from sight; by turning the door or shutter in the direction for opening it, the various arc-like elements slide on each other and allow to obtain a rotation of the door or shutter of even 180° with respect to when it is in the closed condition, thus allowing full utilization of the space of the opening with which such door or shutter is associated.

[0010] Although this solution solves the drawbacks noted above, it has a high constructive complexity and a high cost.

[0011] The aim of the present invention is to solve the above-mentioned technical problems, eliminating the drawbacks of the cited background art, by providing an invention that allows to obtain a concealed hinge for doors or windows that allows to obtain a rotation of the leaf of a door or window even through 180° with respect to the closed condition thereof, so as to be able to utilize the entire space of the opening with which the door or window is associated.

[0012] Within this aim, an object of the invention is to provide a concealed hinge for doors or windows that has a reduced cost.

[0013] This aim and this and other objects, which will become better apparent hereinafter, are achieved by a concealed hinge for doors or windows constituted by a frame or case with which at least one leaf is rotatably associated, said hinge comprising a bridge that is approximately U-shaped in plan view so as to form a base from which a first arm and a second arm protrude which are approximately mutually parallel, characterized in that said first and second arms each interact selectively and respectively with first and second snap-acting means that are designed to guide the opening of said leaf from a closed condition to a first stable condition rotated through approximately 90°, followed by a second stable condition rotated through approximately 90° more, and vice versa.

[0014] Further characteristics and advantages of the invention will become better apparent from the following detailed description of two preferred but not exclusive embodiments of the hinge according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of a door or window to which two hinges according to the invention are applied, with the leaf in the closed condition;

Figure 2 is a view, similar to the preceding one, of the door or window of Figure 1 with the leaf in a partially open condition;

Figure 3 is a view, similar to the preceding one, of the door or window according to the preceding figures, with the leaf in the fully open condition;

Figure 4 is a sectional view, taken along a plane that is perpendicular to the first and second hingeing ax-

es, of a hinge according to the invention applied to a door or window, with the leaf in the closed condition;

Figure 5 is a view, similar to the preceding one, of the hinge of Figure 4 with the leaf in the partially open condition;

Figure 6 is a view, similar to the preceding one, of the hinge of Figures 4 and 5 with the leaf in the fully open condition;

Figure 7 is a perspective view of a detail of the hinge according to the invention;

Figure 8 is an exploded perspective view of the hinge of Figure 7;

Figure 9 is a view, similar to Figure 4, of a further embodiment of the hinge according to the invention;

Figure 10 is a view, similar to Figure 5, of the embodiment of figure 9;

Figure 11 is a view, similar to Figure 6, of the embodiment of Figure 9;

Figures 12 and 13 are a perspective view and a partially exploded view of the internal leaf part;

Figure 14 is a view, similar to Figure 11, of the embodiment according to Figure 9 in the closed condition;

Figure 15 is a view, similar to Figure 11, of the embodiment according to Figure 9 in the condition in which it is partially open by approximately 90°.

[0015] In the exemplary embodiments that follow, individual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other exemplary embodiments.

[0016] Moreover, it is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

[0017] With reference to the figures, the reference numeral 1 designates a concealed hinge for doors or windows 2, such as for example a reinforced door, which are constituted by a box-like frame or case 3 with which at least one box-like leaf 4 is rotatably associated.

[0018] The hinge 1 comprises a bridge 5, which is provided preferably monolithically and is approximately U-shaped in plan view, so as to form a base 6 from which a first arm 7 and a second arm 8, which are approximately mutually parallel, protrude.

[0019] Advantageously, the first arm 7 and the second arm 8 have approximately the same length and their ends lie on planes that are perpendicular to such first and second arms and are mutually parallel.

[0020] The base 6 of the bridge 5 has a first portion 6a, which is inclined so as to form an acute angle, considering as positive a counterclockwise rotation with respect to the first arm 7.

[0021] A second portion 6b, which is approximately perpendicular to the second arm 8 and is connected thereto, is contiguous to such first portion.

[0022] The end of the first arm 7 is or can be hinged about a first vertical hingeing axis that lies within an appropriately provided first seat 9 that is formed axially within a post 10 of the frame or case 3.

[0023] Advantageously, the first arm 7 has, at its free end, a cylindrical tab 24, which lies at right angles to the first arm 7 for at least part of its height and protrudes below it, so that it is inserted rotatably in an appropriately provided cavity, not shown in the accompanying figures, which is formed axially with respect to a first supporting element 25 that is or can be fixed within the first seat 9 formed in the frame or case 3, so as to allow to couple rotatably the first arm 7 to the first seat 9.

[0024] The longitudinal axis of the cylindrical tab 24 therefore constitutes the first hingeing axis with respect to which the first arm 7 of the bridge 5 is hinged.

[0025] The end of the first arm 7 is arranged adjacent to a first wall 16 of the first seat 9, which, in the condition in which the leaf 4 is closed, is arranged approximately parallel to an internal lateral surface 4a of the leaf 4, the base 6 protruding outside the post 10, in the direction of a lateral surface 13 of the adjacent leaf 4, through an appropriately provided opening 16a.

[0026] A rotation of approximately 90° with respect to the post 10 is thus allowed to the first arm 7.

[0027] The end of the second arm 8 is or can be hinged at a second vertical hingeing axis to a pivot 14, which is arranged and coupled within a second seat 12 formed within the at least one leaf 4 in a region that is adjacent to the facing lateral surface 13, that faces, when the leaf 4 is in the closed condition, the first seat 9 of the frame or case 3.

[0028] The pivot 14 is associated at a corner of a supporting plate 15 that is approximately U-shaped in plan view and is shaped approximately partially complementarily with respect to the second seat 12 and is fixed inside it, for example by welding or adhesive bonding.

[0029] Advantageously, the pivot 14 protrudes from a second supporting element 35, which is or can be fixed to the supporting plate 15.

[0030] An access opening 15a for the end of the second arm 8 is provided on the supporting plate 15 at the pivot 14 and is shaped advantageously so as to form an eye 8a for rotary interconnection to the pivot 14.

[0031] The axis of the pivot 14 thus constitutes the second hingeing axis for the second arm 8 of the bridge 5.

[0032] The end of the second arm 8 is arranged adjacent to a second wall 15b of the supporting plate 15 that is adjacent to the internal lateral surface 4a of the leaf 4, the base 6 protruding outside it through the access opening 15a formed on the supporting plate 15, and a corresponding slot, not shown in the accompanying figures, which is provided on the lateral surface 13 of the leaf 4.

[0033] The leaf 4 is therefore allowed to rotate of approximately 90° with respect to the second arm 8.

[0034] The first arm 7 interacts with first snap-acting means, which are adapted to block removably the rotation of the bridge 5 with respect to the first axis of rotation

when a first stable condition rotated through approximately 90°, shown in Figure 5, is reached starting from the closed condition of the leaf 4, shown in Figure 4.

[0035] Advantageously, such first snap-acting means comprise a first spring 26, conveniently of the leaf spring type, which is constituted by an elastically deformable metallic lamina that has a first wing 27 and a second wing 28, which are approximately flat, are mutually connected by an oblique portion 29, and lie, in the non-deformed condition of the first spring 26, on two planes that are approximately mutually parallel and spaced.

[0036] The first wing 27 of the first spring 26 is fixed jointly to the first wall 16 of the first seat 9, while the second wing 28 abuts against the lateral surface of the cylindrical tab 24.

[0037] Advantageously, a first slot 30 is provided on the lateral surface of the cylindrical tab 24 and has such a shape that it can accommodate at least partially inside it the second wing 28 of the first spring 26.

[0038] Advantageously, the shape and arrangement of the cylindrical tab 24 of the first slot 30, and of the first spring 26 are such that starting from the closed condition of the leaf 4 and upon a rotation of the leaf 4, the second wing 28 abuts against the region of the lateral surface of the cylindrical tab 24 that is not affected by the first slot 30 and is thus deformed elastically toward the first wall 16 of the first seat 9.

[0039] By turning further the leaf 4 in the direction for opening it, when the first stable condition rotated through approximately 90°, shown in Figure 5, is reached, the first slot 30 is arranged at the second wing 28, which is pushed elastically within the first slot 30, blocking, starting from this condition, the further rotation of the cylindrical tab 24, and therefore of the bridge 5, with respect to the first hingeing axis.

[0040] A stable condition therefore occurs.

[0041] In the solution shown in Figures 11 to 15, the first snap-acting means, adapted to block removably the rotation of the bridge 5 with respect to the first rotation axis, upon reaching, starting from the closed condition of the leaf 4 shown in Figure 9, a first stable condition rotated through approximately 90° shown in Figure 10, are instead constituted by a shaft 40, which is jointly connected for rotation to the cylindrical tab 24 and protrudes axially with respect to it; in the part of the shaft 40 that is external to the tab 24, two pins 41 a, 41b protrude radially and along a diametrical axis and slide on a lateral surface 42, which is shaped according to an inclined plane that is preferably helical so as to keep the door always at the same distance from the ground, of a bush 43 that is jointly connected to the first supporting element 25 that is or can be fixed within the first seat 9 provided in the frame or case 3.

[0042] Four seats 44 for temporary and stable interaction with the pins 41a, 41b are provided at the lateral surface 42 along two diametrical planes.

[0043] By therefore turning the leaf 4 in the direction for opening it, the pins 41 a, 41b are forced to disengage the seats 44 and move on the lateral surface 42 until they again engage further seats 44 after a rotation through 90°, so as to reach a stable position.

[0044] The second arm 8 interacts with second snap-acting means, which are adapted to block removably the rotation of the bridge 5 with respect to the second axis of rotation, starting from the closed condition of the leaf 4, shown in Figure 4, until such first stable condition rotated through approximately 90°, shown in Figure 5, is reached.

[0045] Advantageously, such second snap-acting means comprise a second spring 31, conveniently of the helical type, which is inserted in an appropriately provided receptacle 32 that is formed axially with respect to an appropriately provided support 33 that is or can be fixed at least partially within the second seat 12 approximately parallel to the internal lateral surface 4a, with the free end directed toward the access opening 15a.

[0046] A ball 34 protrudes partially from the support 33 by way of the action of the thrust applied by the second spring 31 and abuts against the lateral surface of the eye 8a provided at the free end of the second arm 8; advantageously, a second slot 36 is provided on the lateral surface of the eye 8a and has such a shape that it can at least partially accommodate inside it the ball 34.

[0047] Advantageously, the shape and position of the eye 8a, of the second slot 36, of the support 33 and of the ball 34 are such that starting from the closed condition of the leaf 4 and up to the first stable condition rotated through approximately 90°, shown for example in Figure 5, the ball 34 is kept pressed by the second spring 31 within the second slot 36, so as to prevent the rotation of the eye 8a, and therefore of the bridge 5, with respect to the support 33 and therefore with respect to the second seat 12.

[0048] During the rotation from the condition in which the leaf 4 is closed to the condition in which the leaf 4 is rotated through approximately 90°, the second arm 8 is jointly connected for rotation to the leaf 4.

[0049] Advantageously, the concealed hinge 1 comprises means designed to maintain alignment with one or more additional hinges 1 associated with a same door or window 2; as shown for example in Figures 7 and 8, such means can be constituted by a straight torsion bar 20, to the lateral surface of which respectively the first arms 7 or the second arms 8 of the bridges 5 of the various hinges 1 associated with a same door or window 2 are fixed, for example by welding.

[0050] In the exemplary embodiment shown in Figures 7 and 8, the torsion bar 20 coincides with the eye 8a provided at the free end of the second arm 8 of the bridge 5 of various mutually connected hinges 1 (only one of which is shown in Figures 7 and 8).

[0051] The presence of the torsion bar 20 causes the bridges 5 of the various hinges 1 to all rotate synchronously with respect to each other, thus preventing the leaf 4 with which the hinges 1 are associated from being able to tilt abnormally.

[0052] Advantageously, the torsion bar 20 can be fixed to the second arms 8 of the bridges 5 of two or more separate hinges 1 associated with a same door or window 2; in this case, the torsion bar 20 has a hollow tubular structure, so that it can accommodate, at its free ends, two pivots 14 that protrude from the two second supporting elements 35 that are or can be associated jointly within the frame or case 3, together with the torsion bar 20, so as to achieve the hingeing of the leaf 4 to the frame or case 3.

[0053] In this case, the longitudinal axis of the torsion bar 20 constitutes the second hingeing axis of the bridges 5.

[0054] In a further embodiment, not shown in the accompanying figures, the torsion bar 20 can be fixed to the first arms 7 of the bridges 5 of multiple separate hinges 1 associated with a same door or window 2; as an alternative, two separate torsion bars 20 can be fixed respectively to the first arms 7 and to the second arms 8 of multiple separate hinges 1 associated with a same door or window 2.

[0055] As an alternative, in a further embodiment, not shown in the accompanying figures, the torsion bar 20 can be constituted by a solid rod, and it is possible to provide, for example by turning, at the ends of such rod, second pivots with which appropriately provided supports, again not illustrated, are rotatably associable, such supports being jointly associated or associable respectively within the frame or case 3 and/or within the leaf 4, depending on whether the torsion bar 20 is associated with the first and/or second arms of the bridges 5 of the connected hinges 1 of the torsion bar 20.

[0056] Advantageously, the torsion bar 20 can be made of a desired material, such as for example steel, carbon fiber, the material known by the trademark KEVLAR, fiberglass.

[0057] In the embodiment shown in Figures 11 to 15, the second snap-acting means, which are adapted to block removably the rotation of the bridge 5 with respect to the second rotation axis, starting from the closed condition of the leaf 4, shown in Figure 9, until such first stable condition rotated through approximately 90°, shown in Figure 10, is reached, comprise a cylinder 45, which protrudes at right angles from the end of the second arm 8 in the opposite direction with respect to the pivot 14, a diametrical slot 46 being obtained at the free end of the cylinder 45 and acting as a seat for the rotary interconnection of a wheel 47 that is pivoted to the cylinder by means of a pivot 48.

[0058] The first spring 26, conveniently of the leaf spring type, interacts with the rolling surface of the wheel 47 and is constituted by an elastically deformable metallic lamina that has the first wing 27 and the second wing 28, which are approximately flat, are mutually connected by the oblique portion 29 and lie, in the non-deformed condition of the first spring 26, on two planes which are approximately parallel and spaced with respect to each other.

[0059] The first wing 27 of the first spring 26 is monolithic with a U-shaped support 49, which is jointly connected at its ends to a cover 50, which in turn is jointly connected to the first wall 16 of the second seat 12, while the second wing 28 abuts against the rolling surface of the wheel 47.

[0060] Conveniently, the hinge 1 comprises stroke limiting means for the rotation of the leaf 4 with respect to the second axis of rotation, which are constituted advantageously by an abutment element 23 that is preferably approximately L-shaped in plan view and is fixed to the edge of the leaf 4 that is contiguous to the frame or case 3 in the condition in which the leaf 4 is fully open; the abutment element 23 abuts, in the maximum allowed opening condition of the leaf 4, against the second portion 6b of the base 6 of the bridge 5, so as to stop the rotation of the leaf 4 with respect to the second rotation axis.

[0061] Advantageously, the first and second snap-acting means can be replaced with other mechanical means adapted to allow selective positioning among the elements.

[0062] The use of the invention is as follows.

[0063] With reference to the figures, two or more hinges 1 can be associated with a door or window 2, so as to hinge the leaf 4 to the frame or case 3 of the latter.

[0064] As shown for example in Figures 4 and 9, with the leaf 4 in the closed condition, the first arm 7 and the second arm 8 of the bridge 5 of the hinges 1 are fully contained respectively in the first seat 9 and in the second seat 12, and therefore at the most only an extremely small portion of the base 6 of the bridges 5 is visible from outside.

[0065] In the closed condition of the leaf 4 shown in Figure 4, the ball 34 is pushed by the second spring 31 within the second slot 36, thus contrasting the rotation of the bridge 5 with respect to the second hingeing axis; in this condition, the bridge 5 is instead free to rotate with respect to the first hingeing axis.

[0066] In the closed condition of the leaf 4 shown in Figure 9, the first spring 26 keeps the cylinder 45 in position, thus contrasting the rotation of the bridge 5 with respect to the second hingeing axis.

[0067] By imparting a rotation to the leaf 4 in the direction for opening it, the leaf 4 rotates with respect to the first rotation axis until it reaches the first stable condition rotated through approximately a further 90°, shown in Figure 5, and the second wing 28 of the first spring 26 enters elastically the first slot 30, thus blocking the further rotation, in the same direction, of the first arm 7 with respect to the first rotation axis.

[0068] In the embodiment shown in Figure 10, the first spring 26 remains still in contact with the cylinder 45.

[0069] By continuing to impart a rotation to the leaf 4 beyond approximately 90°, and always in the same direction, the rotary torque imparted to the leaf 4 exceeds, as shown in Figure 6, the contrast torque generated by way of the action of the thrust of the second spring 31 on the ball 34: such ball thus exits from the second slot 36

and glides on the lateral surface of the eye 8a, thus allowing the rotation of the leaf 4 about the second hinge axis with respect to the bridge 5, which in this condition is fixed with respect to the frame or case 3.

[0070] In the embodiment shown in Figure 11, the rolling surface of the wheel 47 has passed the oblique portion 29 of the first spring 26, thus disengaging the two components and leaving free the rotation of the leaf 4.

[0071] In this manner, the leaf 4 can be turned until it is arranged in a second stable condition that is rotated through approximately a further 90°, in which it is therefore substantially parallel to the plane of arrangement of the frame or case 3, thus allowing to utilize the entire space of the opening.

[0072] In order to close the leaf 4 it is sufficient to rotate it in the opposite direction to the one described earlier; in a first step, the rotation of the leaf 4 occurs around the second rotation axis, since the first arm 7 of the hinge 1 is kept coupled to the first seat 9 thanks to the action of the first spring 26.

[0073] Continuing the rotation of the leaf 4 in the direction for closing it, at a certain point the ball 34 enters the second slot 36 and the first portion 6a of the base 6 of the bridge 5 abuts against one of the side walls of the second seat 12, preventing the further rotation in this direction of the leaf 4 with respect to the second rotation axis.

[0074] By imparting a further rotation to the leaf 4, when the rotary torque imparted to the leaf 4 exceeds the contrast torque applied to the first arm 7 by way of the action of the first spring 26, the second wing 28 of the latter exits from the first slot 30, allowing the rotation of the first arm 7, and therefore of the leaf 4, about the first hingeing axis, until the closed condition is reached.

[0075] It has thus been found that the invention has achieved the intended aim and objects, a concealed hinge having been provided which allows to achieve the rotation of the leaf of a door or window even through 180° with respect to the closed condition thereof, so as to be able to achieve, even in the open condition, the parallel arrangement of such leaf with respect to the plane of arrangement of the frame or case of the door or window and thus be able to utilize the entire space of the opening with which such door or window is associated.

[0076] Moreover, the production costs of the hinge according to the invention remain low, since it is provided only by means of components that are easy to manufacture and/or assemble.

[0077] The invention is of course susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0078] The materials used, as well as the dimensions that constitute the individual components of the invention, may of course be more pertinent according to specific requirements.

[0079] The various means for performing certain different functions need not certainly coexist only in the illustrated embodiment but can be present per se in many embodiments, including ones that are not illustrated.

[0080] The characteristics indicated as advantageous, convenient or the like may also be omitted or be replaced with equivalents.

[0081] The disclosures in Italian Patent Application no. VE2008A000048, from which this application claims priority are incorporated herein by reference.

[0082] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A concealed hinge for doors or windows constituted by a frame or case with which at least one leaf is rotatably associated, said hinge comprising a bridge that is approximately U-shaped in plan view so as to form a base from which a first arm and a second arm protrude which are approximately mutually parallel, **characterized in that** said first and second arms each interact selectively and respectively with first and second snap-acting means that are adapted to guide the opening of said leaf from a closed condition to a first stable condition rotated through approximately 90°, followed by a second stable condition rotated through approximately 90° more, and vice versa.

2. The hinge according to claim 1, wherein said frame or case and said leaf have a box-like structure, **characterized in that** the end of said first arm is or can be hinged at a first vertical hinge axis that lies within an appropriately provided first seat formed axially within a post of said frame or case, the end of said second arm being hinged or hingeable at a second vertical hingeing axis that lies within a second seat formed within said at least one leaf, in a region that is adjacent to the lateral surface thereof that faces, when said leaf is in the closed condition, said first seat of said frame or case.

3. The hinge according to claims 1 and 2, **characterized in that** said first and second arms have approximately the same length, their ends lying on two separate planes which are perpendicular to said first and second arms and are mutually parallel, said base having a first portion that is inclined so as to form an acute angle, considering as positive a counterclockwise rotation with respect to said first arm, a second portion being contiguous to said first portion and being approximately perpendicular to said second arm and connected thereto.

4. The hinge according to claims 1 and 3, **characterized in that** said first arm has, at its free end, a cylindrical tab that lies at right angles with respect to said first arm for at least part of its height and protrudes below it, so that it is or can be inserted rotatably in a cavity that is formed axially with respect to a first supporting element that is or can be fixed within said first seat formed in said frame in order to rotatably couple said first arm to said first seat, the longitudinal axis of said cylindrical tab constituting said first vertical hingeing axis of said first arm.

5. The hinge according to claims 1 and 4, **characterized in that** the end of said first arm is arranged adjacent to a first wall of said first seat that in said closed condition of said leaf is arranged approximately parallel to the inner lateral surface of said leaf, said base protruding externally with respect to said post in the direction of said lateral surface of said adjacent leaf, through an appropriately provided opening, said first arm being allowed a rotation through approximately 90° with respect to said post.

6. The hinge according to one or more of the preceding claims, **characterized in that** said end of said second arm is or can be hinged, at said second vertical hingeing axis, to a pivot that is arranged and coupled within said second seat of said leaf.

7. The hinge according to claims 1 and 6, **characterized in that** said pivot is associated at a corner of a supporting plate that is approximately U-shaped in plan view and is approximately partially complementarily shaped with respect to said second seat and is fixed inside it.

8. The hinge according to claims 1 and 7, **characterized in that** said pivot protrudes from a second supporting element that is or can be fixed to said supporting plate.

9. The hinge according to claims 1 and 8, **characterized in that** at said pivot, on said supporting plate, there is an access opening for the end of said second arm which is shaped so as to form an eye for rotary interconnection to said pivot, the axis of said pivot constituting said second hingeing axis for said second arm of said bridge.

10. The hinge according to claims 1 and 9, **characterized in that** the end of said second arm is arranged adjacent to a second wall of said supporting plate that is adjacent to said inner lateral surface of said leaf, said base protruding externally to the latter through said access opening, provided in said supporting plate, and a corresponding slot formed on said lateral surface of said leaf, said leaf being allowed a rotation through approximately 90° with respect to said second arm.

11. The hinge according to one or more of the preceding claims, **characterized in that** said first snap-acting means comprise a first spring of the leaf spring type that is constituted by an elastically deformable metallic lamina that has a first wing and a second wing, which are approximately flat and are mutually connected by an oblique portion and lie, in the non-deformed condition of said first spring, on two planes that are approximately parallel and spaced with respect to each other, said first wing being fixed jointly to said first wall of said first seat, said second wing abutting against the lateral surface of said cylindrical tab.

12. The hinge according to claims 1 and 11, **characterized in that** a first slot is provided on said lateral surface of said cylindrical tab and has such a shape that it can at least partially accommodate inside it said second wing of said first spring.

13. The hinge according to claims 1 and 12, **characterized in that** the shape and position of said cylindrical tab, of said first slot, and of said first spring are such that starting from said closed condition of said leaf and upon a rotation of said leaf, said second wing abuts against the region of said lateral surface of said cylindrical tab that is not affected by said first slot, being deformed elastically toward said first wall of said first seat.

14. The hinge according to claims 1 and 13, **characterized in that** upon reaching said first condition in which it is rotated through approximately 90°, said first slot is arranged at said second wing, which is pushed elastically into said first slot, blocking, starting from said condition, the further rotation of said cylindrical tab and of said bridge with respect to said first hingeing axis so as to define a stable condition.

15. The hinge according to one or more of the preceding claims, **characterized in that** said second snap-acting means comprise a second spring of the helical type, which is inserted in a receptacle that is formed axially with respect to a support that is or can be fixed at least partially within said second seat, approximately parallel to said inner lateral surface of said leaf, with the free end directed toward said access opening.

16. The hinge according to claims 1 and 15, **characterized in that** a ball protrudes partially from said support and is pushed by said second spring and abuts against the lateral surface of said eye provided at said free end of said second arm, on the lateral surface of said eye there being a second slot, which has such a shape that it can accommodate said ball in-

side it at least partially.

17. The hinge according to claims 1 and 16, **characterized in that** the shape and position of said eye, of said second slot, of said support and of said ball are such that starting from said closed condition of said leaf and up to said first condition in which it is rotated through approximately 90°, said ball is kept pressed by said second spring within said second slot, so as to prevent the rotation of said eye with respect to said second vertical hingeing axis so as to define a stable condition.

18. The hinge according to one or more of the preceding claims, **characterized in that** it comprises means that are adapted to maintain alignment with one or more additional hinges associated with a same door or window.

19. The hinge according to claims 1 and 18, **characterized in that** said means are constituted by a straight torsion bar, to the lateral surface of which said first or second arms of said bridges of said hinges associated with a same door or window are fixed respectively, said torsion bar maintaining the rotation of said bridges of said hinges associated with a same door or window synchronous.

20. The hinge according to claims 1 and 19, **characterized in that** said torsion bar coincides with said eye that is present at said free end of said second arm of said bridge.

21. The hinge according to claims 1 and 20, **characterized in that** said torsion bar is fixed to said first arms of said bridges of two separate hinges associated with a same door or window.

22. The hinge according to claims 1 and 21, **characterized in that** said torsion bar has a hollow tubular structure, so that it can accommodate, at its ends, two of said first pivots, which are associated or associable jointly within said frame or case, together with said torsion bar, so as to achieve the hingeing of said leaf to said frame or case, the axis of said torsion bar constituting said first hingeing axis for said bridges.

23. The hinge according to claims 1 and 21, **characterized in that** said torsion bar is fixed to said second arms of said bridges of multiple distinct hinges associated with a same door or window, said torsion bar having a hollow tubular structure, so that it can accommodate at its ends third pivots which are associated or associable jointly within said leaf, together with said torsion bar, so as to achieve the hingeing of said leaf to said frame or case, the axis of said torsion bar constituting said second hingeing axis for said bridges.

24. The hinge according to claims 1 and 21, **characterized in that** two distinct bars of said torsion bars are fixed respectively to said first arms and to said second arms of multiple separate hinges associated with a same door or window..

25. The hinge according to one or more of the preceding claims, **characterized in that** said torsion bar has a solid rod-like structure, at the ends of which there are second pivots with which it is possible to associate rotatably appropriately provided supports that are associated or associable jointly respectively within said frame or case and/or within said leaf, depending on whether said torsion bar is associated with said first and/or second arms of said bridges of said hinges connected by said torsion bar.

26. The hinge according to one or more of the preceding claims, **characterized in that** said torsion bar is made of a desired material.

27. The hinge according to claims 1 and 26, **characterized in that** said torsion bar is made of steel or carbon fiber or of the material known by the trademark KEVLAR or fiberglass.

28. The hinge according to one or more of the preceding claims, **characterized in that** the rotation of said leaf in the direction for opening it is limited by the abutment of said second portion of said base with an abutment element, which is approximately L-shaped in plan view and is fixed to an edge of said leaf that is contiguous, in the fully open leaf condition, to said frame or case.

29. The concealed hinge for doors or windows constituted by a frame or case with which at least one leaf is rotatably associated, said hinge comprising a bridge, which is approximately U-shaped in plan view, so as to form a base from which a first arm and a second arm protrude which are approximately mutually parallel, **characterized in that** said first and second arms each interact selectively with mechanical means that are designed to allow selective placement and a guide for the opening of said leaf from a closed condition to a first stable condition in which it is rotated through approximately 90°, followed by a second stable condition in which it is rotated through approximately another 90°, and vice versa.

30. The hinge according to one or more of the preceding claims, **characterized in that** said first snap-acting means, adapted to block removably the rotation of the bridge with respect to the first rotation axis upon reaching, starting from the closed condition of said leaf, a first stable condition rotated through approx-

imately 90°, are constituted by a shaft, which is jointly connected for rotation to said cylindrical tab and protrudes axially with respect to it, in the part of said shaft that is external to said tab there protruding, radially and along a diametrical axis, a pair of pins, which interact with the lateral surface, which is shaped like an inclined plane that has a preferably helical arrangement so as to keep the door always at the same distance from the ground, of a bush that is jointly connected to said first supporting element which is or can be fixed within the first seat formed in the frame or case.

31. The hinge according to claims 1 and 30, **characterized in that** four seats are provided, at said lateral surface along two diametrical planes, for temporary and stable interaction with said pins, which as a consequence of a rotation imparted to said leaf in the direction for opening it are forced to disengage said seats and slide on said lateral surface, which is shaped like an inclined plane with a preferably helical arrangement, until they engage again other seats after a 90° rotation so as to reach a further stable position.

32. The hinge according to one or more of the preceding claims, **characterized in that** said second snap-acting means, suitable to block removably the rotation of said bridge with respect to said second rotation axis, starting from the closed condition of said leaf until said first stable condition rotated through approximately 90° is reached, comprise a cylinder that protrudes at right angles from the end of said second arm in the opposite direction with respect to said pivot, a diametrical slot being obtained at the free end of said cylinder and acting as a seat for the rotary interconnection of a wheel that is pivoted to said cylinder by means of a pivot.

33. The hinge according to claims 1 and 32, **characterized in that** a first spring, conveniently of the leaf type, interacts with the rolling surface of said wheel and is constituted by an elastically deformable metallic lamina that has a first wing and a second wing, which are approximately flat and are mutually connected by an oblique portion and are arranged, in the non-deformed condition of said first spring, on two planes which are approximately parallel and spaced with respect to each other, said first wing of said first spring being monolithic with a U-shaped support that is joined at its ends to a cover that in turn is jointly connected to said first wall of said second seat, while said second wing abuts against the rolling surface of said wheel.

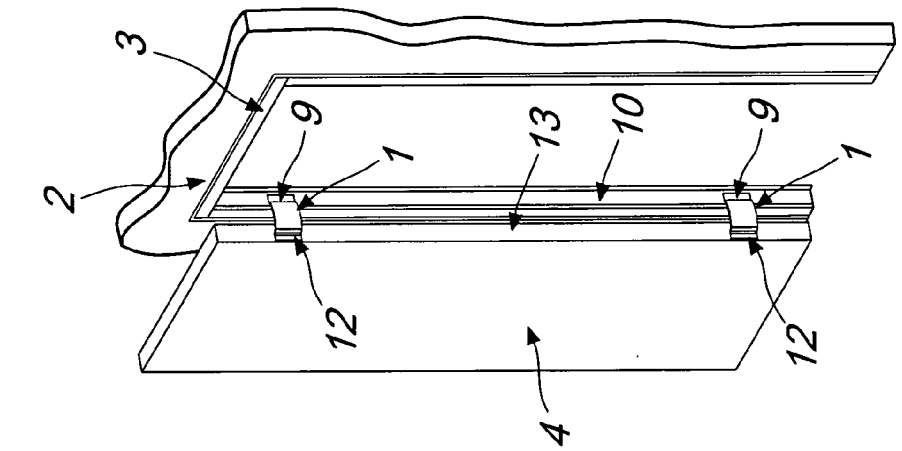

Fig. 3

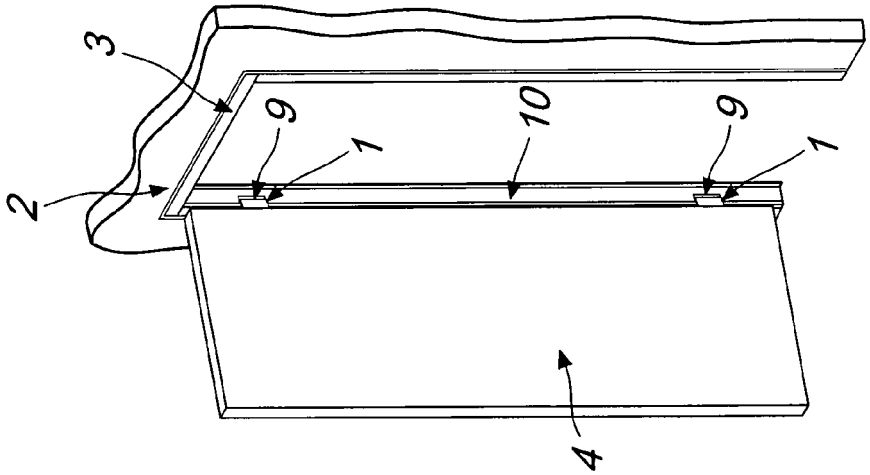

Fig. 2

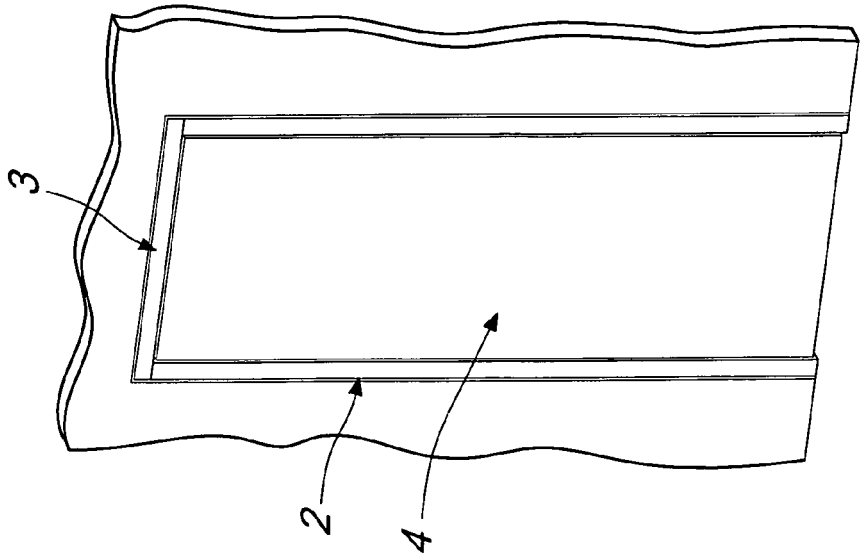

Fig. 1

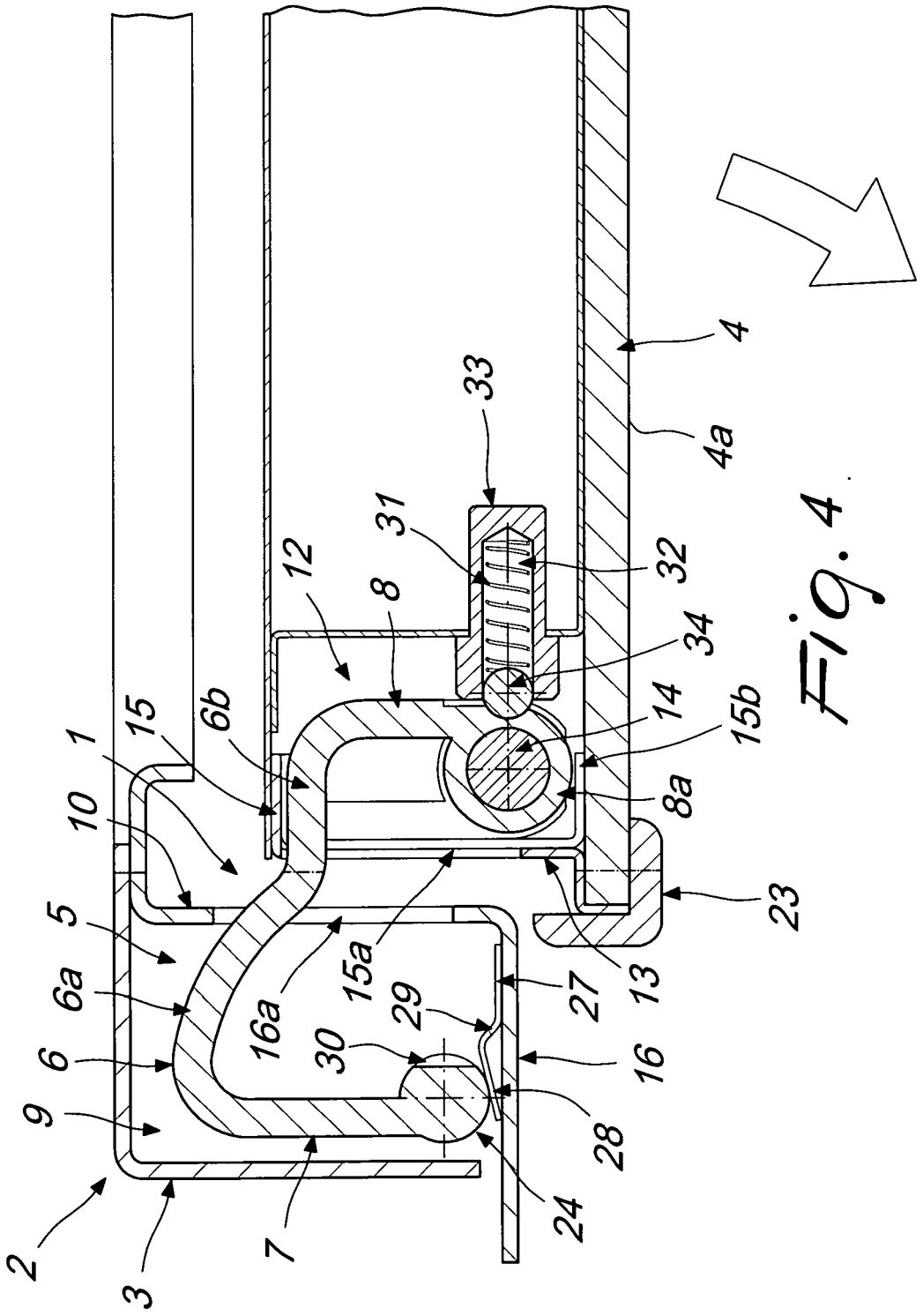
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Fig. 4

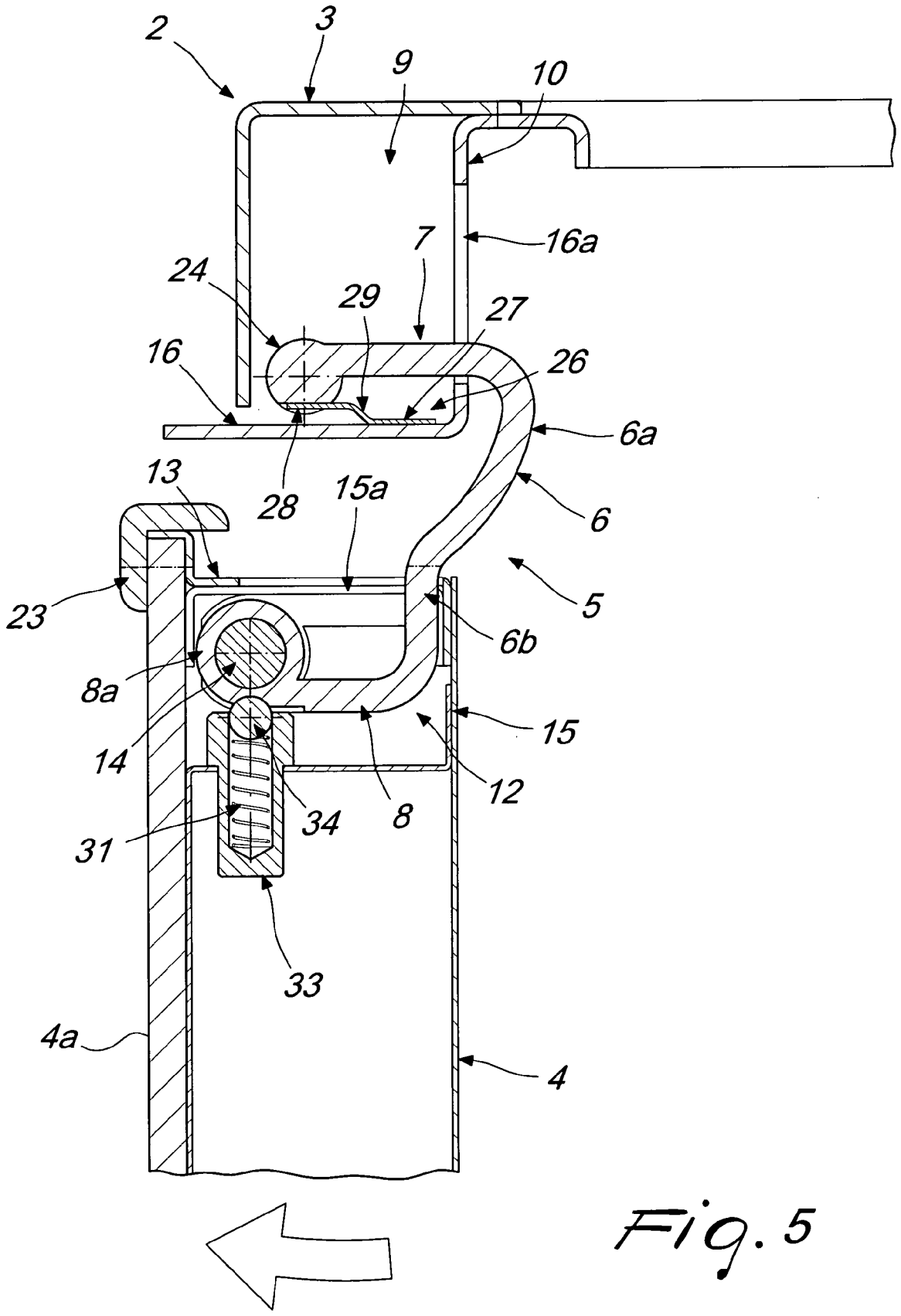
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Fig. 5

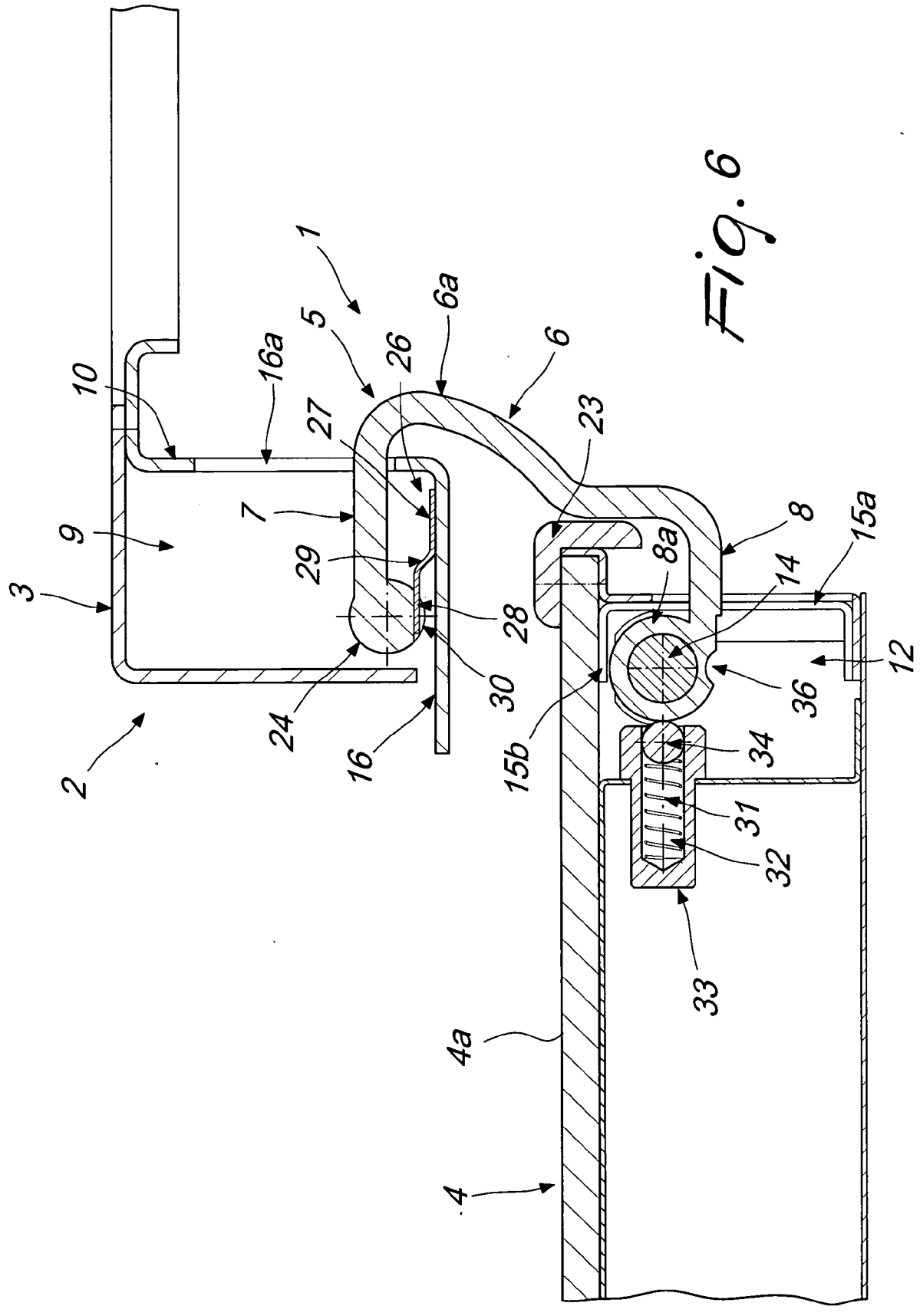
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Fig. 6

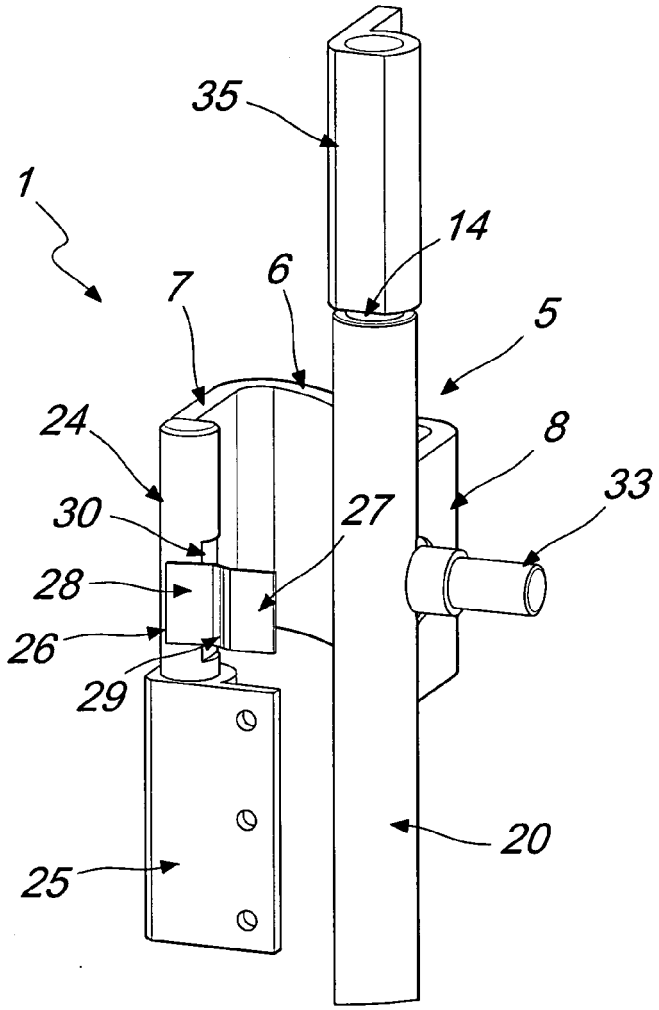
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Fig. 7

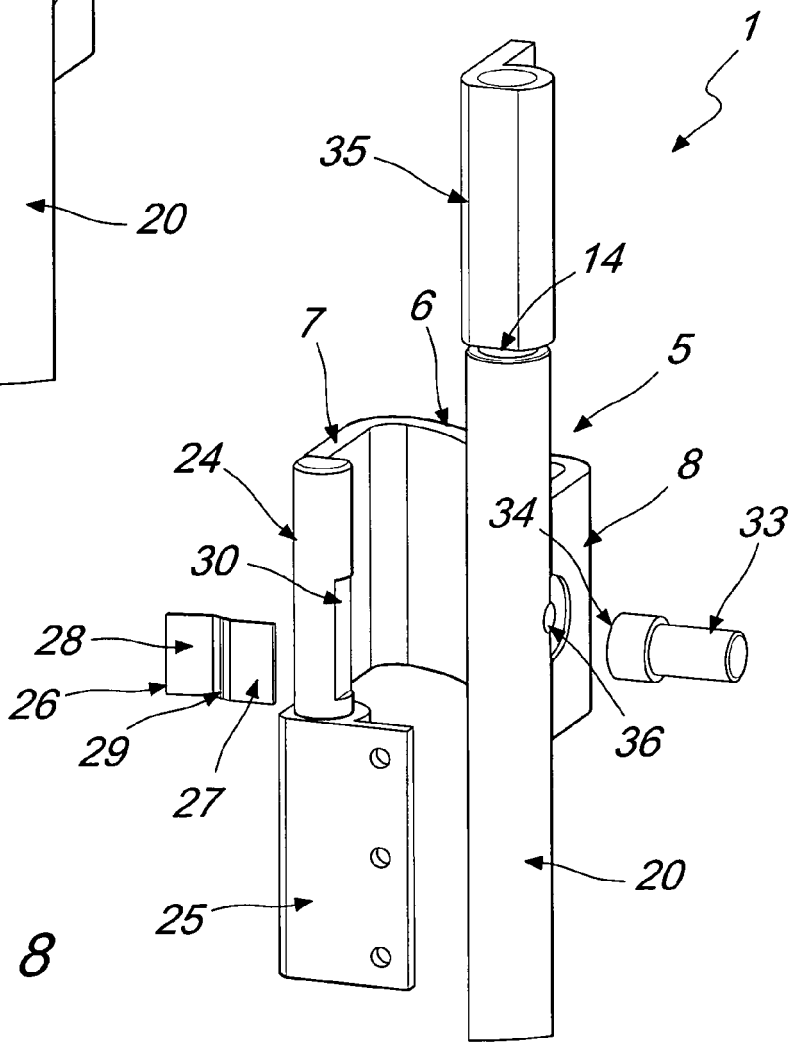
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Fig. 8

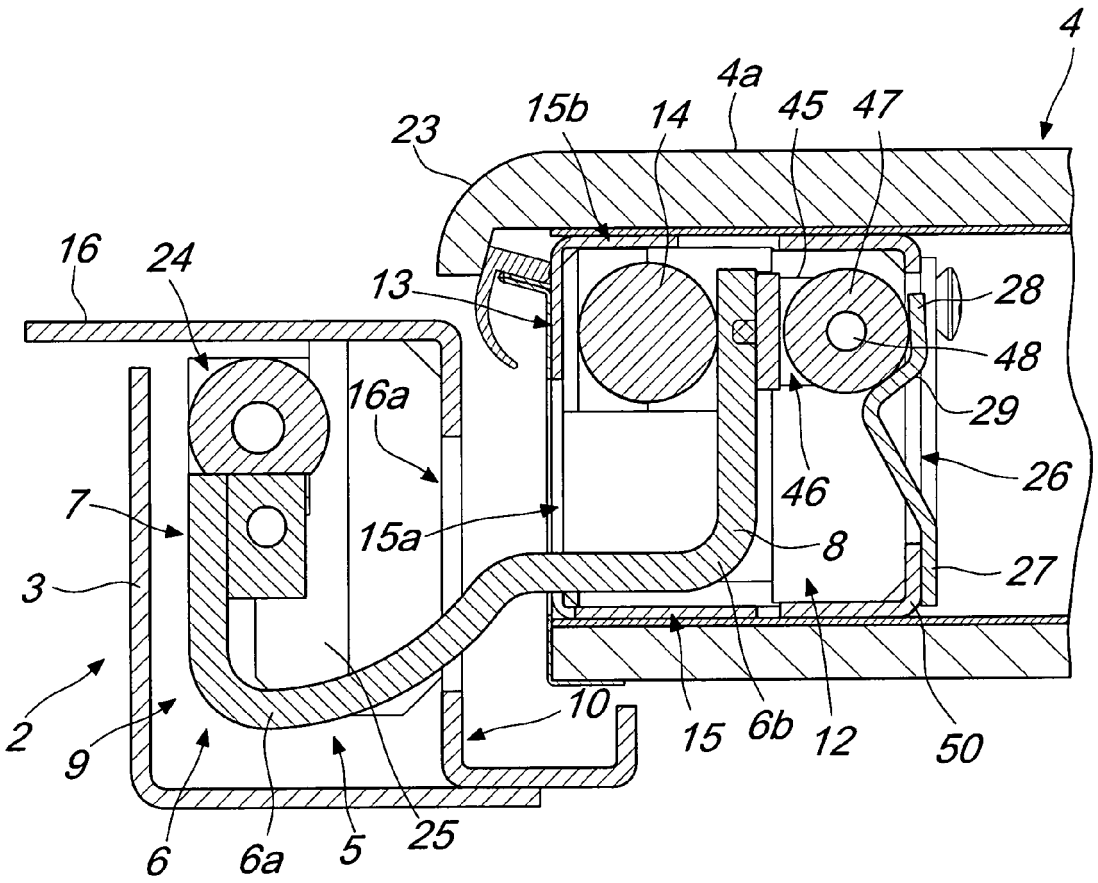
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Fig. 9

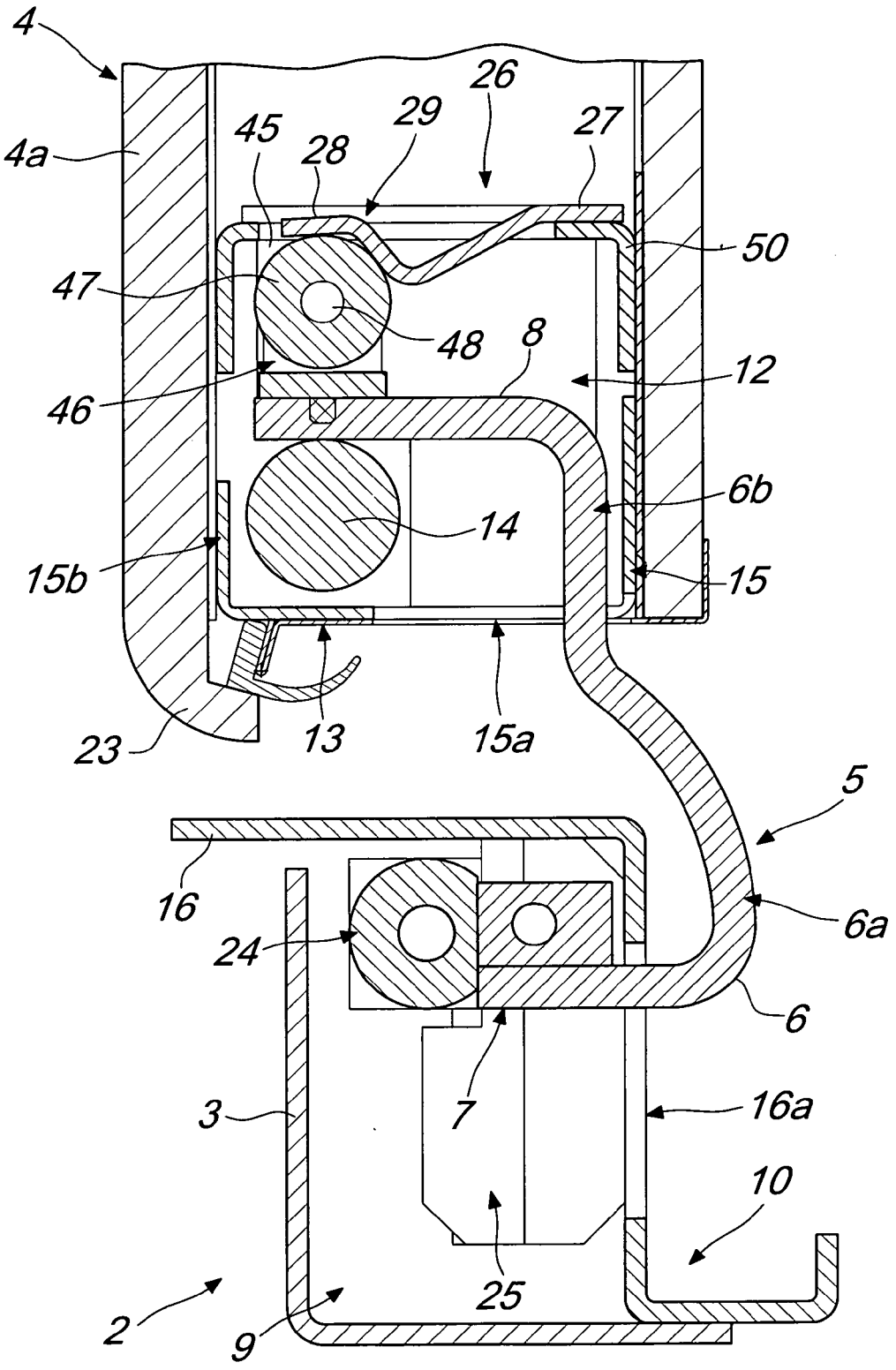
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Fig. 10

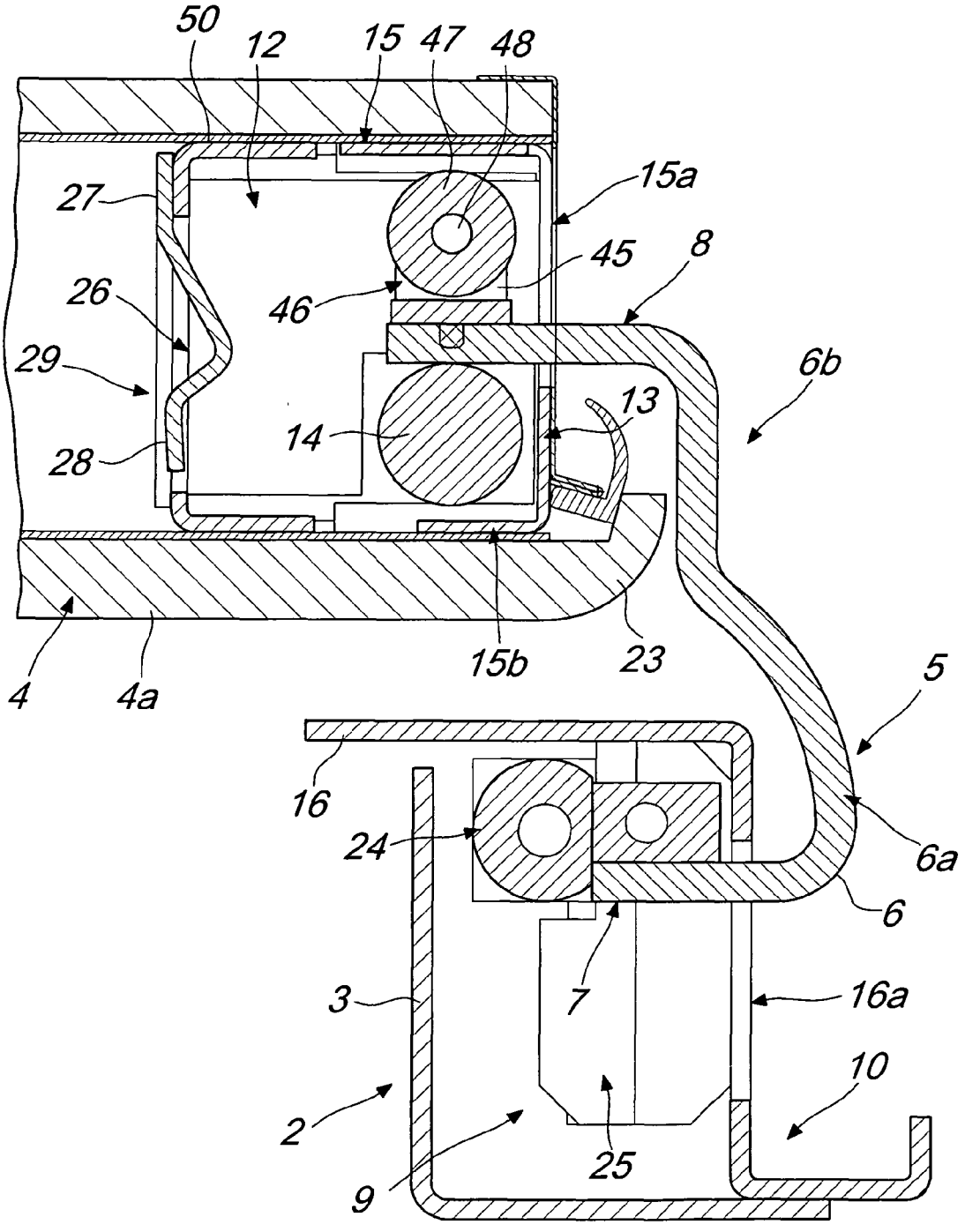
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Fig. 11

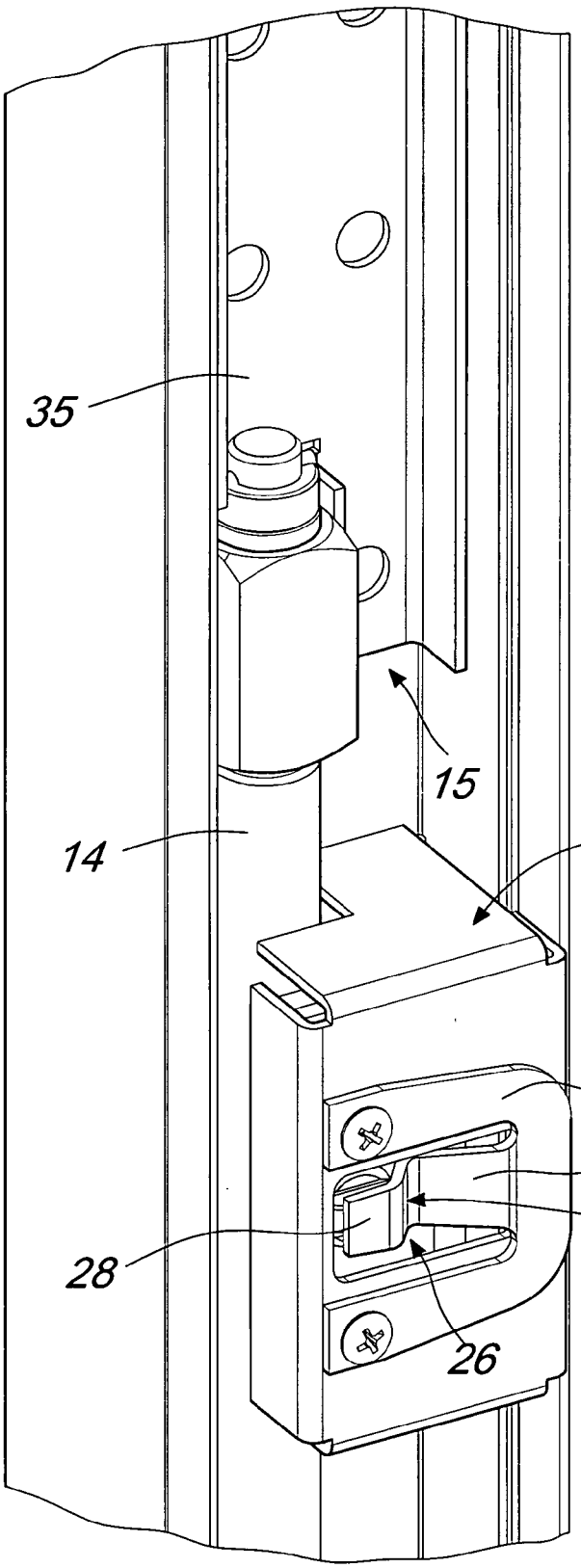

Fig. 12

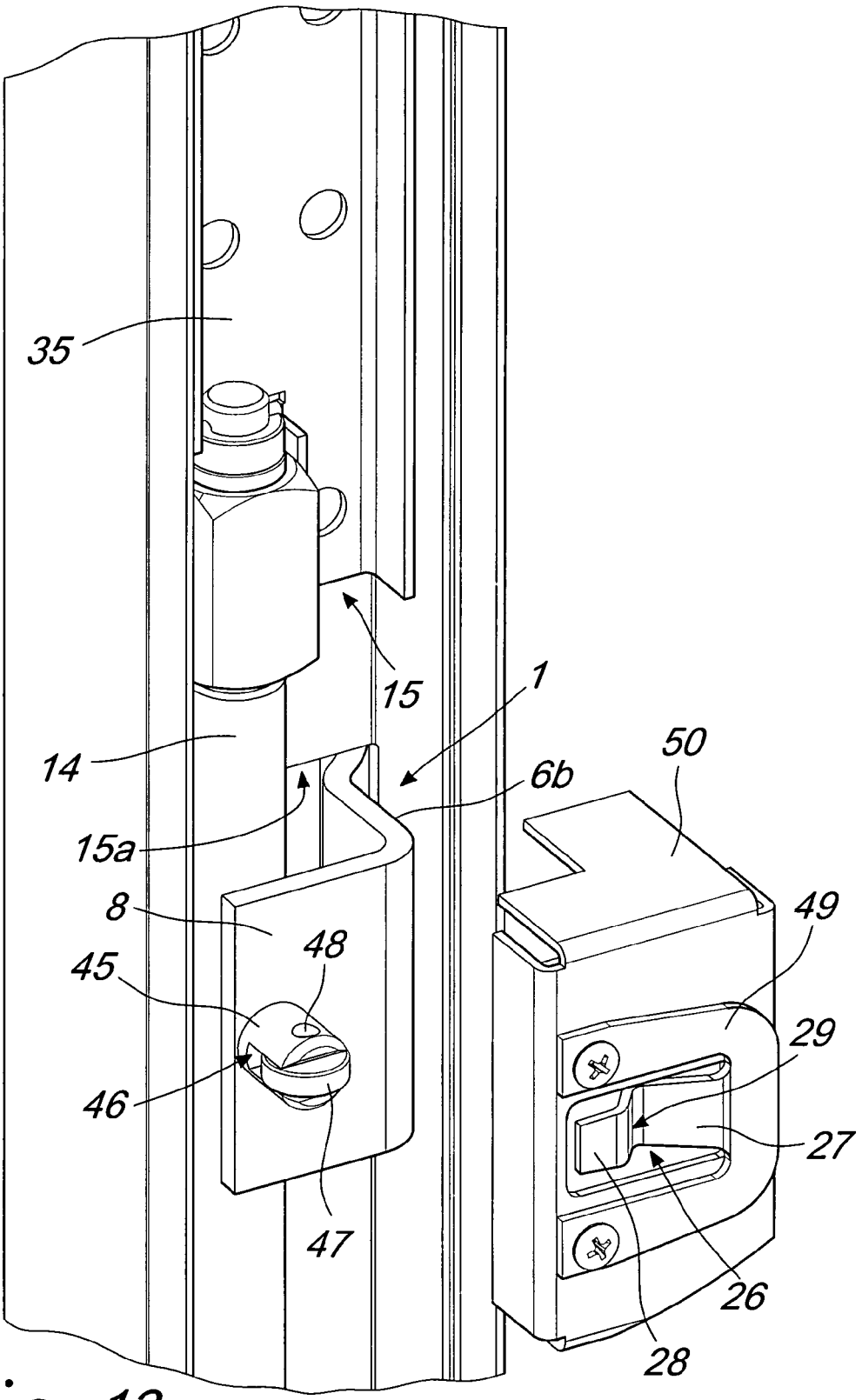

Fig. 13

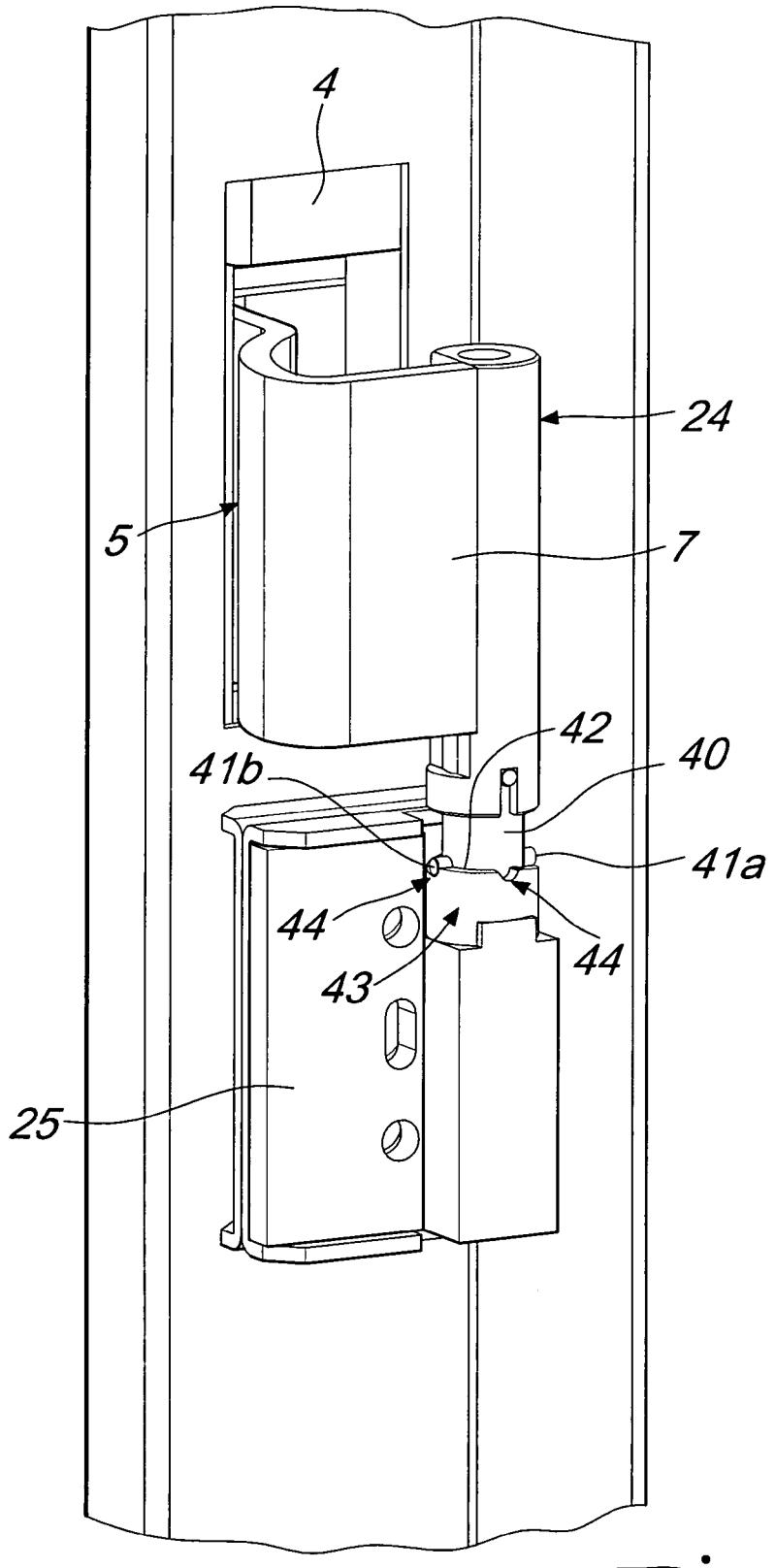

Fig. 14

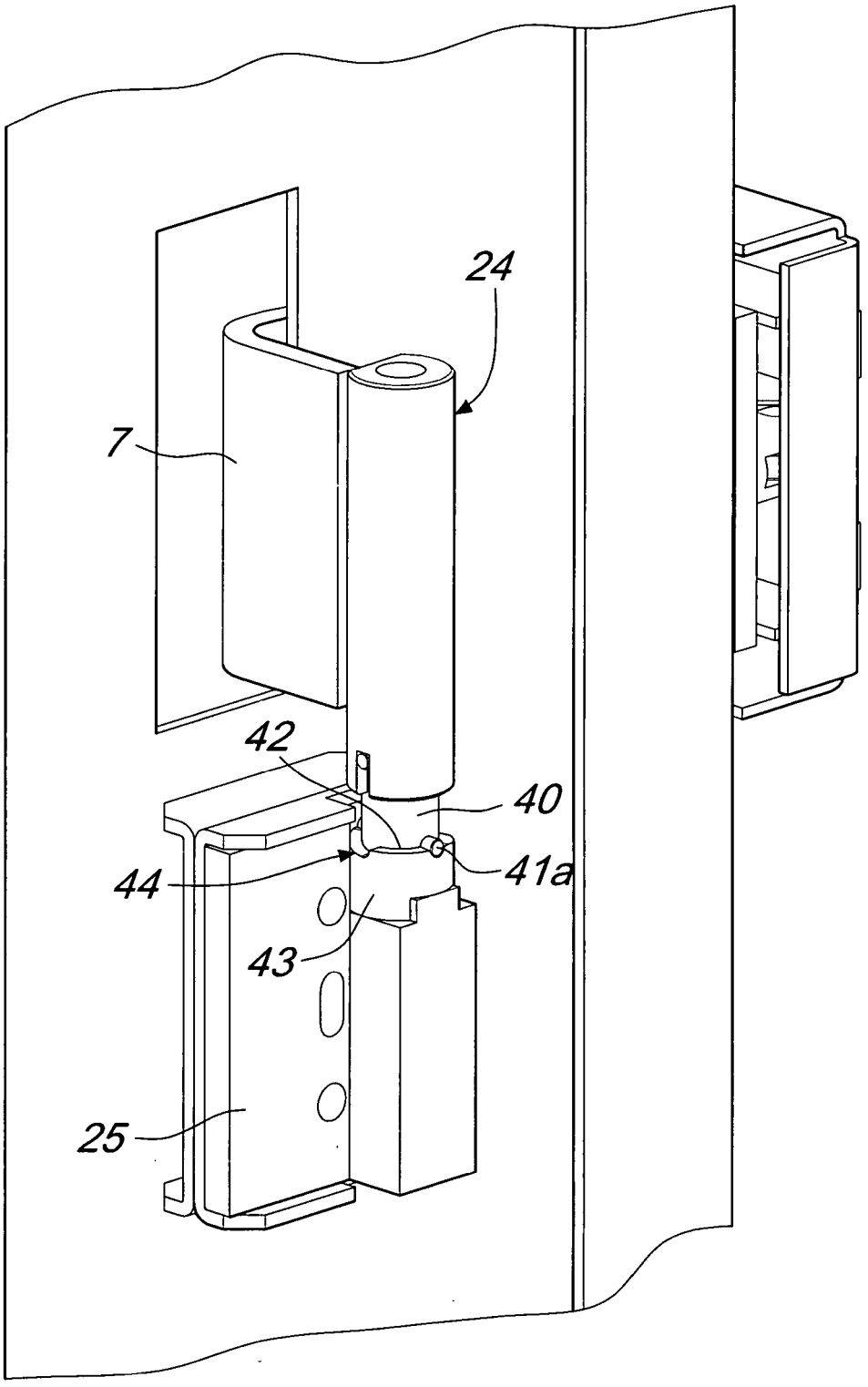

Fig. 15

REFERENCES CITED IN THE DESCRIPTION

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- IT VE20080048 A **[0081]**