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(71) Applicant: **System Holz S.r.l.**  
**22040 Cremnago di Inverigo (CO) (IT)**

(72) Inventor: **Canzi, Luigi**  
**20837 Veduggio con Colzano (MB) (IT)**

(74) Representative: **Martegani, Franco et al**  
**via Carlo Alberto, 41**  
**20900 Monza (IT)**

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(54) **DOUBLE ARTICULATED QUADRILATERAL HINGE WITH DAMPER**

(57) The present invention relates to a dampened snap-hinge (1,10), comprising:  
 - a first articulated quadrilateral (2) comprising a first plate (4) and provided with a first and second lever (23,32) and an arm (21)  
 - a second articulated quadrilateral (3) comprising a second plate (5) and provided with a first and second lever (23,32) and an arm (31)  
 said first (23) and second (32) lever being in common between the first (2) and the second (3) articulated quad-

rilateral,  
 the hinge (1,10) being movable between an open configuration and a closed configuration, in which the plates (4,5) are arranged differently with respect to each other, wherein the hinge (1,10) also comprises a damper (7) for damping the transition between the open configuration and the closed configuration and vice versa, wherein said damper (7) is interposed between one of the first or second levers (23,32) and said arm (21,31) of one of the first (2) and second (3) quadrilaterals.

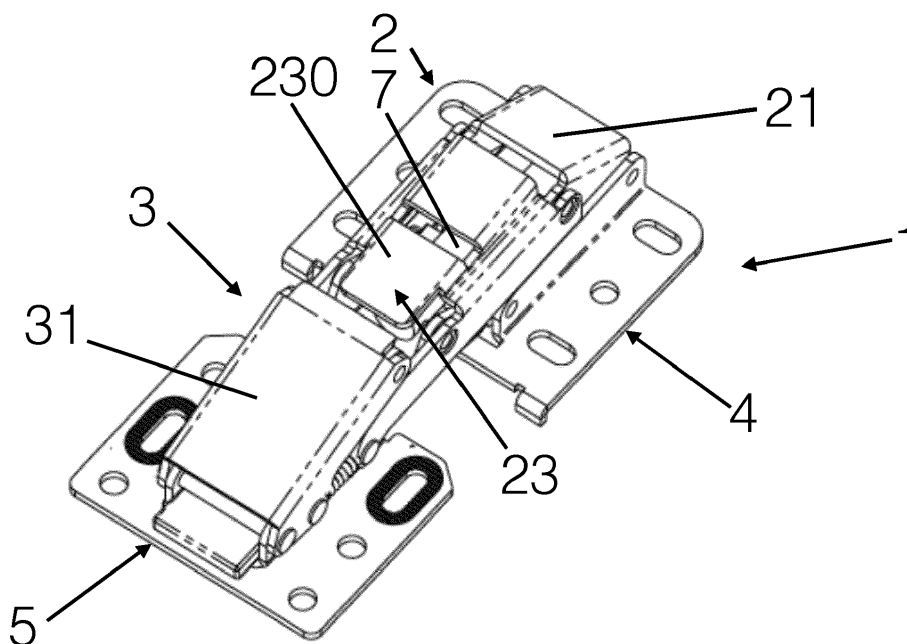


Fig. 1

## Description

### TECHNICAL FIELD

[0001] The present invention relates to the field of double articulated quadrilateral hinges, in particular, but not exclusively, to hinges used for rotatably connecting a door panel with a fixed frame.

[0002] The preferred and most advantageous application of the invention falls within the field of interior furnishing and furnishing for motorhomes, caravans, boats and the like.

### STATE OF THE ART

[0003] Double articulated quadrilateral hinges are generally known in the state of the art.

[0004] These hinges guarantee a fluid opening movement and the possibility of being stably stopped in run-end positions corresponding to open or closed door conditions.

[0005] The use of a damper for preventing the door from banging against the frame, when it reaches one of the end positions, with the consequent damage that can be caused, is also known in the state of the art.

[0006] In short, the damper slows down the movement of the door panel avoiding these drawbacks.

[0007] An example of this hinge of the known art is disclosed in international patent application WO2014/061041 of the owner DGN.

[0008] This document teaches how to produce an articulated double quadrilateral snap hinge with a damped closure, comprising a first and second articulated quadrilateral that share two levers, said hinge being provided with a damping element interposed between one of the two quadrilaterals and the relative plate, in order to damp the transition between the open and closed configuration.

[0009] Although this solution is useful in some ways, it has some limitations, however.

[0010] A first limitation lies in the fact that the position of the damper (between a plate and the articulated quadrilateral) is not optimal in certain respects, with regard to the encumbrances.

[0011] Another limitation consists in the fact that the damper is completely exposed towards the outside, with the consequence that a possible loss of damping fluid (oil or grease) could easily dirty the door panel or frame of the piece of furniture.

[0012] This latter drawback is also worsened by the fact that, when the door panel is closed, the damping element is arranged in an almost vertical position, with the stem facing downwards: as the hinge is normally arranged in this specific configuration (the time in which the door panel is closed is in fact normally longer than the time in which it is open to allow access to the inside of the piece of furniture), a possible loss of damping fluid is in certain respects facilitated, and the use of fluid-free dampers is recommended.

[0013] Another limitation of this solution is linked to the fact that the return spring acts on the articulation of the hinge during the whole movement, from the open to the closed condition.

5 [0014] This implies that, during use, the user must overcome the force of the spring, also for ranges of movement within which the force of the spring does not exert any useful influence for the functionality of the hinge; in particular, in the first stretch between the closed and open condition, the force of the spring does not facilitate the movement of the door panel but, on the contrary, hinders the operation of the user.

10 [0015] Finally, a last limitation of this solution derives from the fact that, in an open condition of the door panel, the whole weight of the same (and the relative torque) is supported by the spring itself, with the consequence that the latter has a relatively high wire diameter and, with time, its mechanical characteristics deteriorate, with an overall deterioration in its functioning.

### OBJECTIVES AND SUMMARY OF THE INVENTION

[0016] The objective of the present invention is to overcome the drawbacks of the known art.

25 [0017] In particular, the objective of the present invention is to provide a hinge, according to the preamble of the first enclosed claim, which is compact and/or reduces the possibility of losses of fluid of the damper and/or is easily manoeuvrable.

30 [0018] Another objective of the invention is to provide such a hinge as an alternative to the known hinges.

[0019] These and further objectives of the present invention are achieved by means of a hinge that incorporates the characteristics of the enclosed claims, which form an integral part of the present description.

35 [0020] The general idea at the basis of the present invention is to position the damping element between an arm of the articulated quadrilateral and a lever in common between the two articulated quadrilaterals that form the hinge.

[0021] This solution, in addition to being a valid alternative to the known hinges, also offers a series of advantages.

40 [0022] First of all, the damper does not interfere with the plates associated with the articulated quadrilaterals and allows a hinge having more compact dimensions to be obtained.

[0023] Secondly, when the hinge is closed, the damper is substantially horizontal, with the consequence of preventing or reducing possible losses of fluid from its interior.

45 [0024] In addition, according to an optional and advantageous aspect, the hinge of the invention comprises a shaped cursor, which slides parallelly with respect to the plate with which it is coupled, and provided with a seat for housing a shaft that is integral with one of the levers of one of the quadrilaterals; the seat is destined for snap-receiving (thanks to a spring acting between the cursor

and plate), the shaft of the lever when the hinge is in an open condition.

**[0025]** In this way, a further advantage is obtained, relating to the fact that, when the door panel is open, at least part of the weight and torque of the panel is discharged without subjecting the return spring to stress, allowing - as an alternative or in combination - the assembly of a less robust spring or prolonging the operating life of the spring.

**[0026]** This also allows the return spring to operate only when the door panel is open, preventing the force of the same from interfering with the opening operations effected by the user, as the return spring only exerts its force in the proximity of the open position and not in the closed position.

**[0027]** Further advantageous characteristics are object of the enclosed claims, which should be considered as being an integral part of the present description.

### SHORT DESCRIPTION OF THE DRAWINGS

**[0028]** The invention is described hereunder with reference to non-limiting examples, provided for illustrative and non-limiting purposes in the enclosed drawings. These drawings illustrate different aspects and embodiments of the invention and, when appropriate, reference numbers illustrating structures, components, materials and/or similar elements in different figures are indicated by similar reference numbers.

**[0029]** In the enclosed drawings:

Figure 1 illustrates a basic embodiment of a hinge according to the present invention;

Figures 2-5 are sectional views of the hinge of figure 1, in an open, intermediate and closed condition respectively, and along the sectional plane S-S of figure 4;

Figure 6 illustrates an evolved embodiment of a hinge according to the present invention;

Figures 7-10 are sectional views of the hinge of figure 5 in an open, intermediate and closed condition respectively, and along the sectional plane T-T of figure 9.

### DETAILED DESCRIPTION OF THE INVENTION

**[0030]** Whereas the invention can undergo various modifications and alternative constructions, some preferred embodiments are shown in the drawings and will be described hereunder in detail.

**[0031]** It should be understood, however, that there is no intention of limiting the invention to the specific embodiment illustrated, but, on the contrary, the same aims at covering all modifications, alternative constructions, and equivalents that fall within the scope of the invention as defined in the claims.

**[0032]** The use of "for example", "etc.", "or" indicates non-exclusive alternatives with no limitations, unless oth-

erwise indicated.

**[0033]** The use of "comprises" means "comprises, but not limited to", unless otherwise indicated.

**[0034]** Indications such as "vertical" and "horizontal", "upper" and "lower" (in the absence of other indications) should be read with reference to the assembly (or operating) conditions and referring to the normal terminology used in the everyday language, wherein "vertical" indicates a direction substantially parallel to that of the force of gravity vector "g" and "horizontal" a direction perpendicular to the same.

**[0035]** Figures 1-5 show a basic embodiment of a hinge 1 according to the invention; figures 6-10 show an evolved form 10 of the hinge of the invention.

**[0036]** As the differences between the basic embodiment 1 and the evolved embodiment 10 only relate to the return spring, the following description is valid for both embodiments, except, of course, for the portion relating to the return spring; for this purpose, in the enclosed drawings 1-10, the same reference number indicates the same parts, with the same function, and consequently a detailed description will be provided only for the basic embodiment.

**[0037]** With reference to figures 1-5, these illustrate the basic embodiment of the hinge 1 of the invention.

**[0038]** Said hinge proves to be a dampened snap hinge and comprises, for this purpose:

- a first 2 articulated quadrilateral comprising a first plate 4 and provided with a first and second lever 23,32 and an arm 21.
- and a second 3 articulated quadrilateral comprising a second plate 5 and provided with a first and second lever 23,32 and an arm 31.

**[0039]** It should obviously be noted that the plates can themselves be part of the respective articulated quadrilaterals (as in the exemplificative figures) or variably coupled (welded, for example) with the same quadrilaterals 2,3.

**[0040]** The first lever 23 and the second lever 32 are in common with the first 2 and second 3 articulated quadrilateral, to form the hinge 1, which is movable between an open (figure 2) and a closed (figure 4) configuration; typically, the plates 4, 5 are arranged differently with respect to each other, in the two configurations, so as to allow the articulation in rotation of two elements T and P, for example (but not exclusively), a frame T and a door panel P.

**[0041]** The hinge 1 also comprises a damper 7 for damping the transition between the open configuration and the closed configuration and vice versa.

**[0042]** In general, the damper 7 is characteristically interposed between one of the first or second levers 23,32, and the arm 21,31 of one of the first 2 or second 3 quadrilaterals.

**[0043]** In the two embodiments illustrated herein, the basic embodiment 1 and the evolved embodiment 10,

the damper 7 is coupled with the first quadrilateral 2, in particular between the arm 21 and the articulation fulcrum X1 of the levers 23,32.

**[0044]** In some alternative embodiments (not illustrated), the damper 7 is coupled with the second quadrilateral 3 in particular between the arm 31 and the articulation fulcrum X1 of the two levers 23,32.

**[0045]** The advantage deriving from the embodiments described is immediately apparent by observing, for the basic embodiment, figure 4 (and correspondently figure 9 for the evolved embodiment): when the hinge is closed, the damper 7 is almost horizontal (it should be noted that these hinges are used in pieces of furniture in which the door panel P rotates around a horizontal axis, as in the case of furniture for motorhomes, caravans, and the like); the damper 7, especially when it contains oil or grease, is therefore less subject to leakages.

**[0046]** In the same way, the overall reduced encumbrance of the hinge 1,10 according to the invention, can be noted, which is almost completely contained within the dimensions of the plates 4, 5.

**[0047]** With respect to figures 1-5, the first lever 23 is hinged to the arm 21 of the first quadrilateral 2, to the second lever 32 and to the plate 5 of the second quadrilateral 3, whereas the second lever 32 is hinged to the arm 31 of the second quadrilateral 3, to the first lever 23 and to the plate 4 of the first quadrilateral 2.

**[0048]** The fulcrum points are typically produced with suitable pins, to which no further mention will be made herein as they are well-known in the state of the art.

**[0049]** It should be noted that at least the portion of lever 23 adjacent to the damper 7 is advantageously provided with a box-shaped cover 230 destined for (at least partially) concealing the damper 7 from sight.

**[0050]** The snap functioning of the hinge is guaranteed, in these embodiments, by at least one return spring; in this sense the difference should be noted between the basic embodiment in which there is a single spring 12 and the evolved embodiment 10 in which there are two adjacent springs 120.

**[0051]** The spring(s) 12, 120 operate at least between one of the quadrilaterals 2,3 and a respective plate 4,5, in particular between the arm 21 or 31 and the plate 4 or 5.

**[0052]** Before entering into the detail of the springs 12,120, it would be useful to briefly explain their function: they act on the arm 21, between the same and the plate 4, in particular in the fulcrum point X2 between the plate 4 and the lever 32 and they contribute to keeping the hinge 1,10 stably in the run-end positions (open and closed configuration).

**[0053]** With reference to the basic embodiment 1 of the hinge, in order to advantageously avoid interference with the damper, as can be observed in the section S-S of figure 5, the spring 12 and the same damper 7 are positioned offset with respect to a central symmetry plane SIM of the quadrilaterals 2 and 3 of the hinge 1.

**[0054]** In the case of the evolved embodiment 3 of the hinge, on the contrary, there are two springs 120, as can

be observed in section T-T of figure 10, which are positioned symmetrically on one side and on the other side of the central symmetry plane SIM of the quadrilaterals 2 and 3 of the hinge 10: this allows an even more compact assembly, given that the damper 7, even if it has significant dimensions, can be partially housed in the closed configuration of the hinge 10, in the space between the two springs 120.

**[0055]** With respect again to the characteristics in common between the basic embodiment 1 and the evolved embodiment 10, it should be noted that the arm 31 of a quadrilateral 3 optionally and advantageously comprises a shaft 35 integral therewith; the hinge 1,10 also comprises a shaped cursor 8 which defines a housing seat 81 for the shaft 35.

**[0056]** When the hinge 1,10 is in an open configuration, (figures 2 and 6), the seat 81 is occupied by the shaft 35 and the cursor 8 is pushed in contact with the shaft 35 to create with the latter a form engagement in correspondence with the seat 81.

**[0057]** When the hinge 1,10 is in a closed configuration (figures 4 and 9), the seat 81 is, on the contrary, free from engagement with the shaft 35.

**[0058]** The engagement between the shaft 35 and the seat 81 preferably takes place in conjunction with an opening span of the hinge higher than 50% from the closed configuration: it should in fact be observed that in figures 3 and 8, which show configurations in which the hinge is open by about 45°, i.e. about 50% of the maximum movement span - the shaft 35 is not yet engaged with the seat 81.

**[0059]** In other words, the shaft 35 occupies the seat 81 of the cursor close to the closed configuration of the hinge 1,10.

**[0060]** The cursor 8 is advantageously assembled on one of the plates 5 and can be moved with respect to the latter in a plane substantially parallel to the same.

**[0061]** At least one check spring 85 is provided between the cursor 8 and the plate 5, destined for pushing the cursor 8, at least when the hinge 1,10 is in an open configuration, towards the shaft 35, so as to create the form engagement between the seat 81 and the shaft 35.

**[0062]** As the check spring 85 is destined for contributing to stably maintaining the hinge in an open configuration, it is immediately evident that, during the actuation of the hinge 1,10, the user will only have to counteract the force of the spring 85 in the end section of the run, i.e. when the shaft 35 comes into contact with the cursor 8 and pushes it in the opposite direction with respect to the force of the spring 85, until the shaft 35 becomes engaged in the seat 81.

**[0063]** The sliding of the cursor 8 with respect to the plate 5 is guaranteed by a guide-slide coupling between the two, which can be prepared by a skilled person in the field without any further disclosures.

**[0064]** As in the solutions illustrated, the cursor 8 is preferably associated with that plate (plate 5 in this case) whose arm (31 in this case) is not coupled with the damp-

er 7, so as to further reduce the encumbrance.

**[0065]** Alternatively, or in combination, the cursor 8 is associated with that plate (plate 5 in this case) which is not coupled with the return spring(s) 12, 120.

**[0066]** In the examples provided, as is evident, both of the above situations are achieved in combination, to the advantage of the compactness of the hinge 1,10 thus produced.

**[0067]** As far as the damper 7 is concerned, the same is preferably of the type with one stem and with a jacket telescopically engaged with each other, wherein the damping is obtained thanks to a fluid (typically oil or grease) acting between them.

**[0068]** These types of dampers for hinges are generally known in the state of the art and consequently no further mention will be made thereof.

**[0069]** The objectives indicated above have therefore been achieved.

**[0070]** Numerous variants to what has so far been described, are obviously possible.

## Claims

### 1. A dampened snap-hinge (1,10), comprising:

- a first articulated quadrilateral (2) comprising a first plate (4) and provided with a first and second lever (23,32) and an arm (21)
- a second articulated quadrilateral (3) comprising a second plate (5) and provided with a first and second lever (23,32) and an arm (31)

said first (23) and second (32) lever being in common between the first (2) and the second (3) articulated quadrilateral,

the hinge (1,10) being movable between an open configuration and a closed configuration, in which the plates (4,5) are arranged differently with respect to each other, wherein the hinge (1,10) also comprises a damper (7) for damping the transition between the open configuration and the closed configuration and viceversa

#### characterized in that

said damper (7) is interposed between one of the first or second levers (23,32) and said arm (21,31) of one of the first (2) and second (3) quadrilaterals.

2. The dampened snap-hinge (1,10) according to claim 1, wherein the damper (7) is interposed between said arm (21,31) and an articulation fulcrum (X1) between the first (23) and second (32) lever.
3. The dampened snap-hinge (1,10) according to claim 1 or 2, wherein the first lever (23) is hinged to the arm (21) of the first quadrilateral (2), to the second lever (32) and to the plate (5) of the second quadrilateral (3) and

the second lever (32) is hinged to the arm (31) of the second quadrilateral (3), to the first lever (23) and to the plate (4) of the first quadrilateral (2).

4. The dampened snap-hinge (1,10) according to one or more of the previous claims, wherein the arm (31) of one quadrilateral (3) comprises a shaft (35) integral therewith, and wherein the hinge (1,10) comprises a shaped cursor (8) which defines a housing seat (81) for the shaft (35), wherein

- when the hinge (1,10) is in an open configuration, the seat (81) is occupied by the shaft (35) and the cursor (8) is pushed into contact with the shaft (35) for creating, with the same, a form engagement in correspondence with the seat (81)

- when the hinge (1,10) is in a closed configuration, the seat (81) is free from engagement with the shaft (35).

5. The dampened snap-hinge (1,10) according to the previous claim, wherein said cursor (8) is assembled on one of said plates (5), movable with respect to said plate (5) on a plane substantially parallel to the plate (5) and wherein at least one check spring (85) is provided between said cursor (8) and said plate (5), destined for pushing said cursor (8), at least when the hinge (1,10) is in an open configuration, so as to create said form engagement between the seat (81) and the shaft (35).

6. The dampened snap-hinge (1,10) according to one or more of the previous claims, wherein a portion of lever (23) adjacent to the damper (7) is provided with a box-shaped cover (230) destined for at least partially concealing the damper (7) from sight.

7. The dampened snap-hinge (1,10) according to one or more of the previous claims, comprising at least one return spring (12,120) acting at least between one of the quadrilaterals (2,3) and a respective plate (4,5).

8. The dampened snap-hinge (1,10) according to the previous claim, wherein said at least one return spring (12,120) acts between said plate (4,5) and the arm (21,31) of the respective quadrilateral articulated to said plate (4,5).

9. The dampened snap-hinge (1) according to claim 7 or 8, comprising a return spring (12), wherein said spring (12) and said damper (7) are positioned offset with respect to a central symmetry plane (SIM) of the quadrilaterals (2,3).

10. The dampened snap-hinge (10) according to claim 7 or 8, comprising two return springs (120), wherein

said springs (120) are positioned symmetrically on one side and on the other side of a central symmetry plane (SIM) of the quadrilaterals (2,3), the damper (7) being partly housed in the space between the two springs (120) in a closed configuration of the hinge. 5

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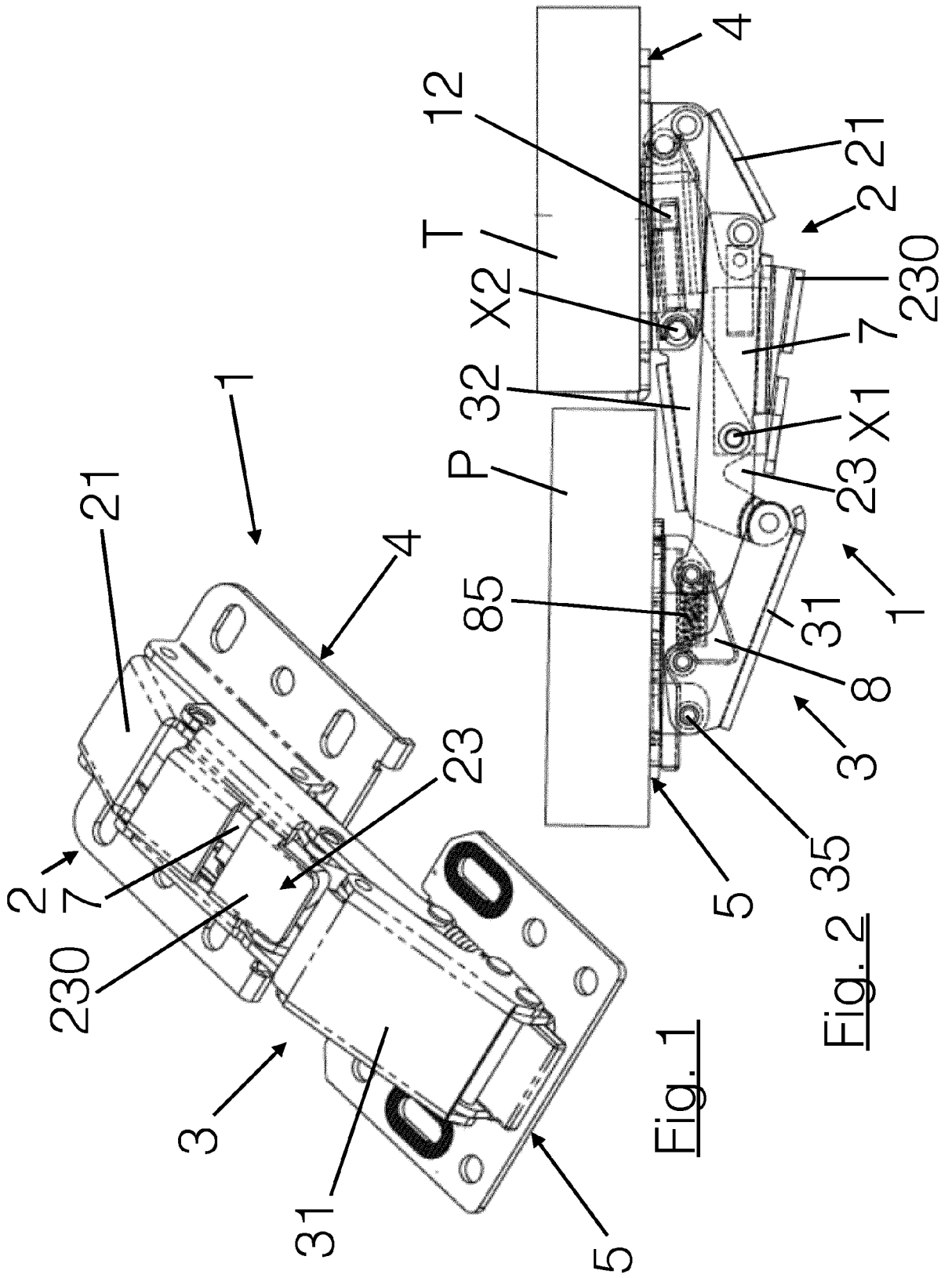


Fig. 1

Fig. 2

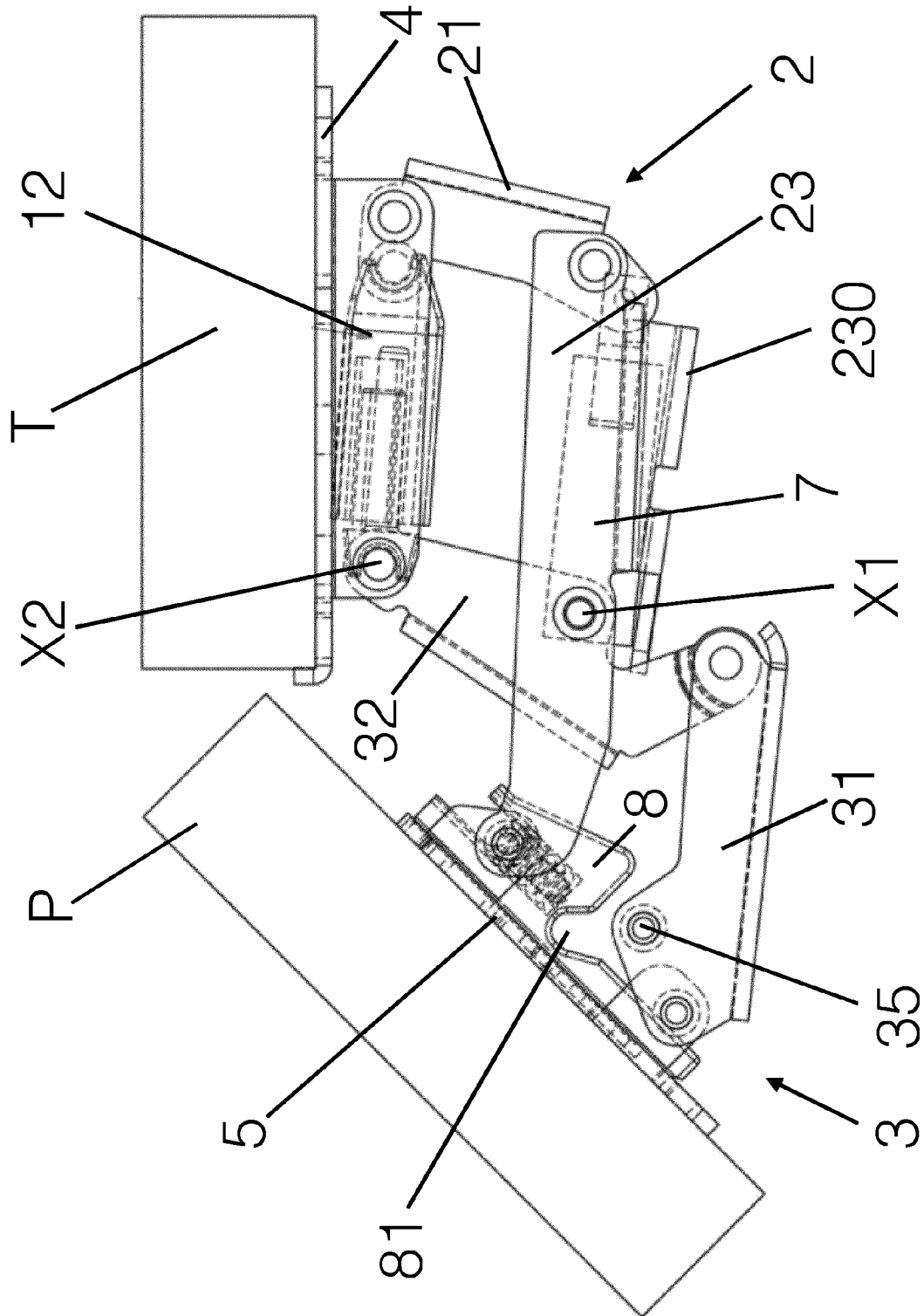


Fig. 3

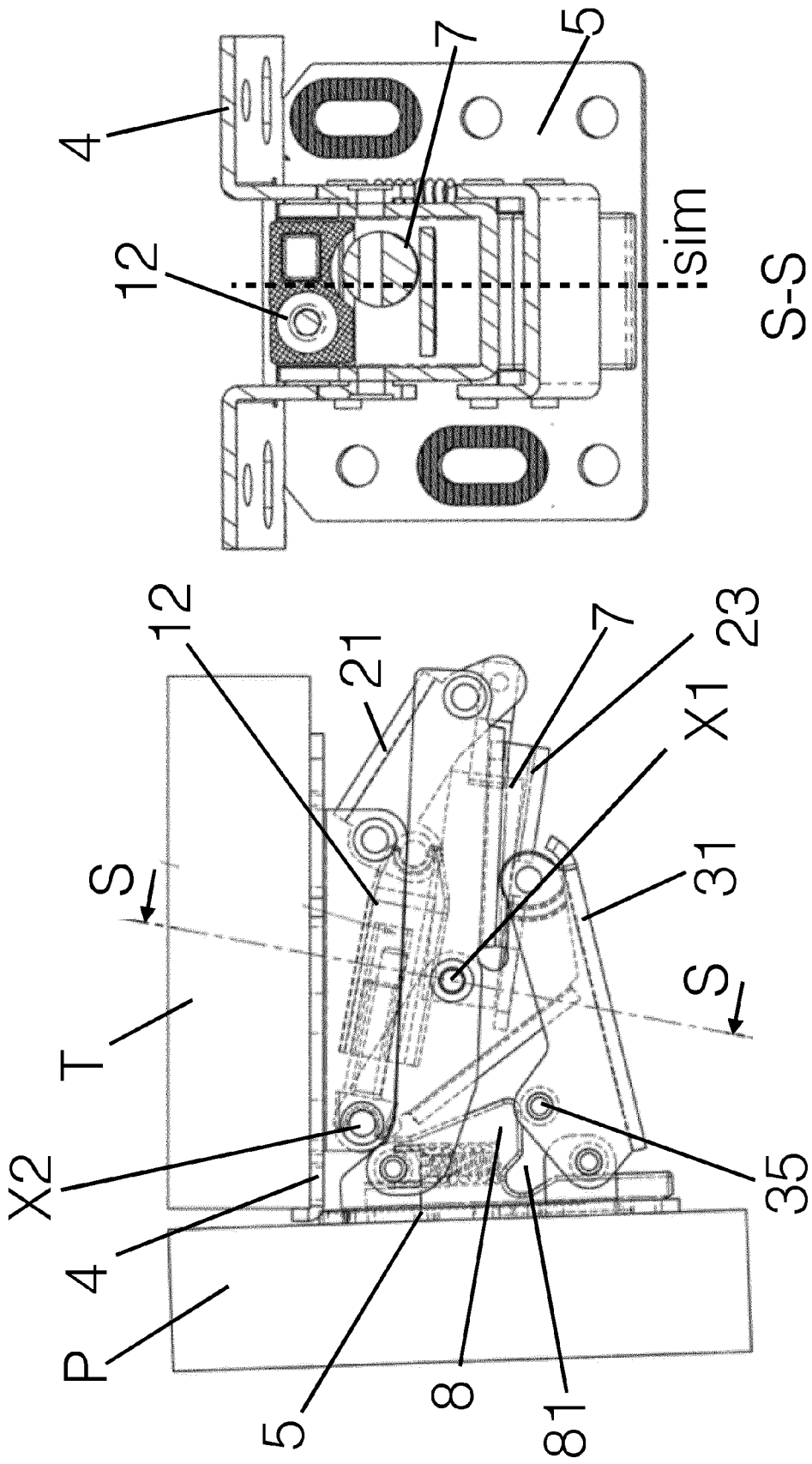


Fig. 5

Fig. 4

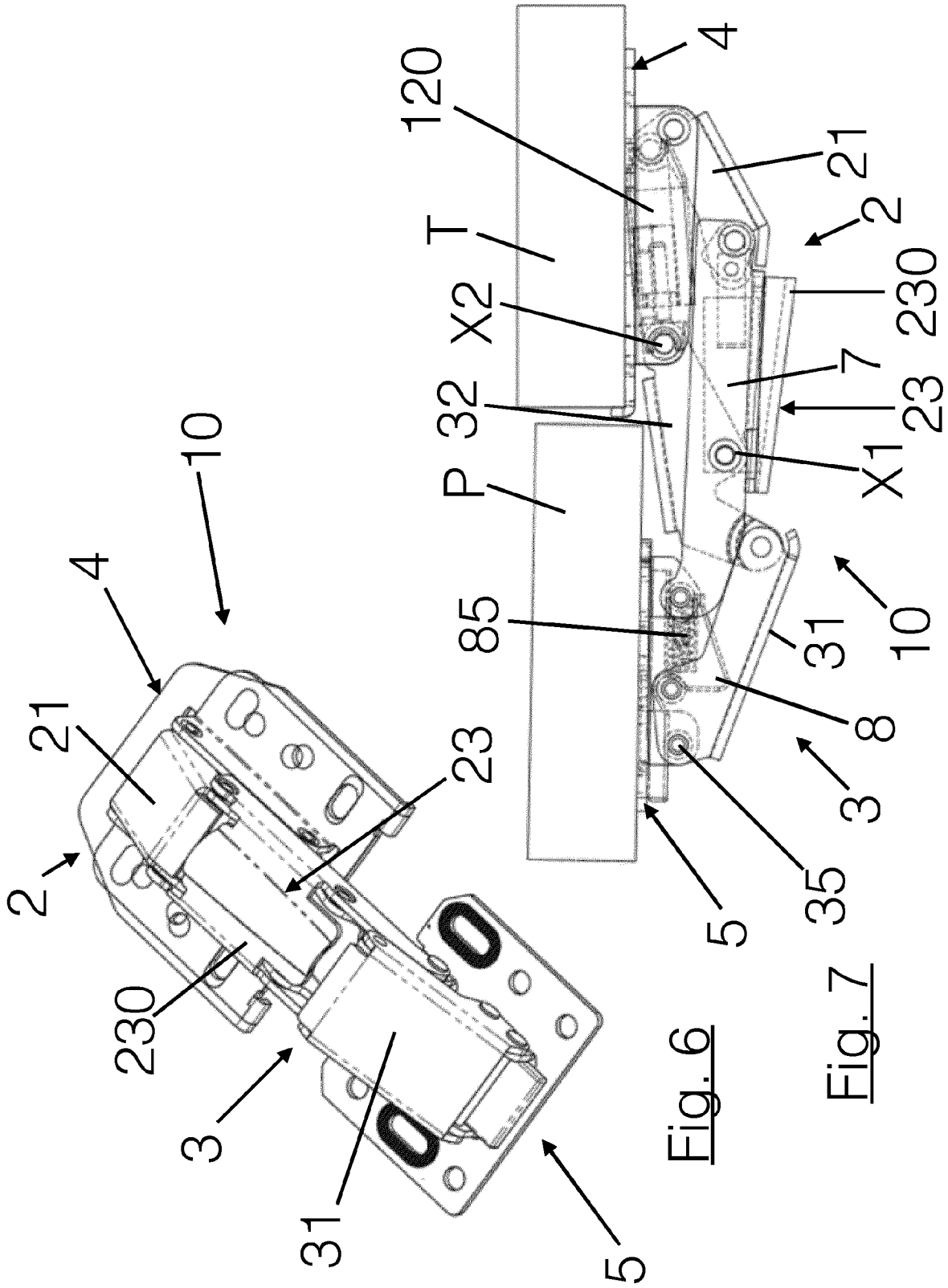


Fig. 6

Fig. 7

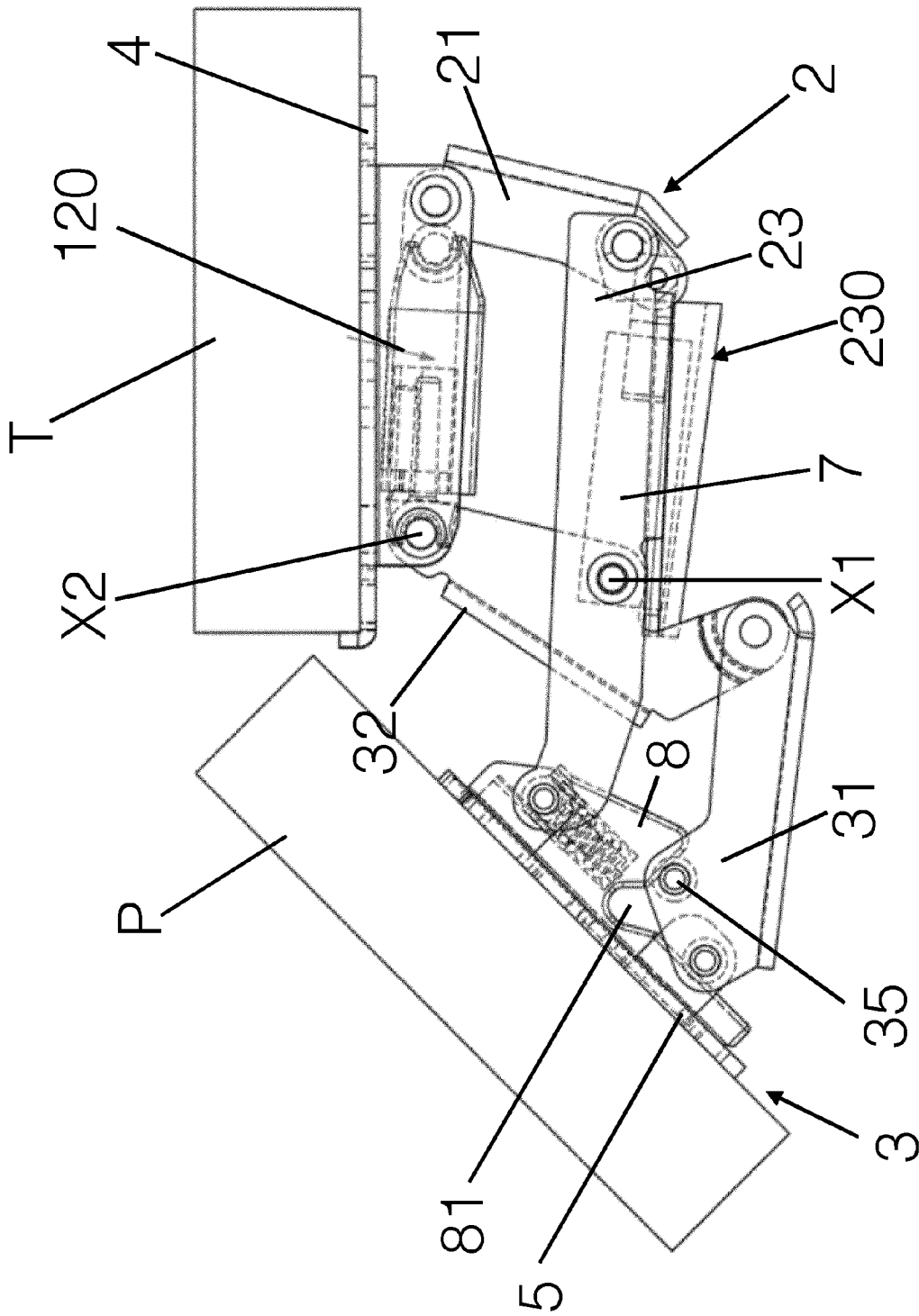


Fig. 8

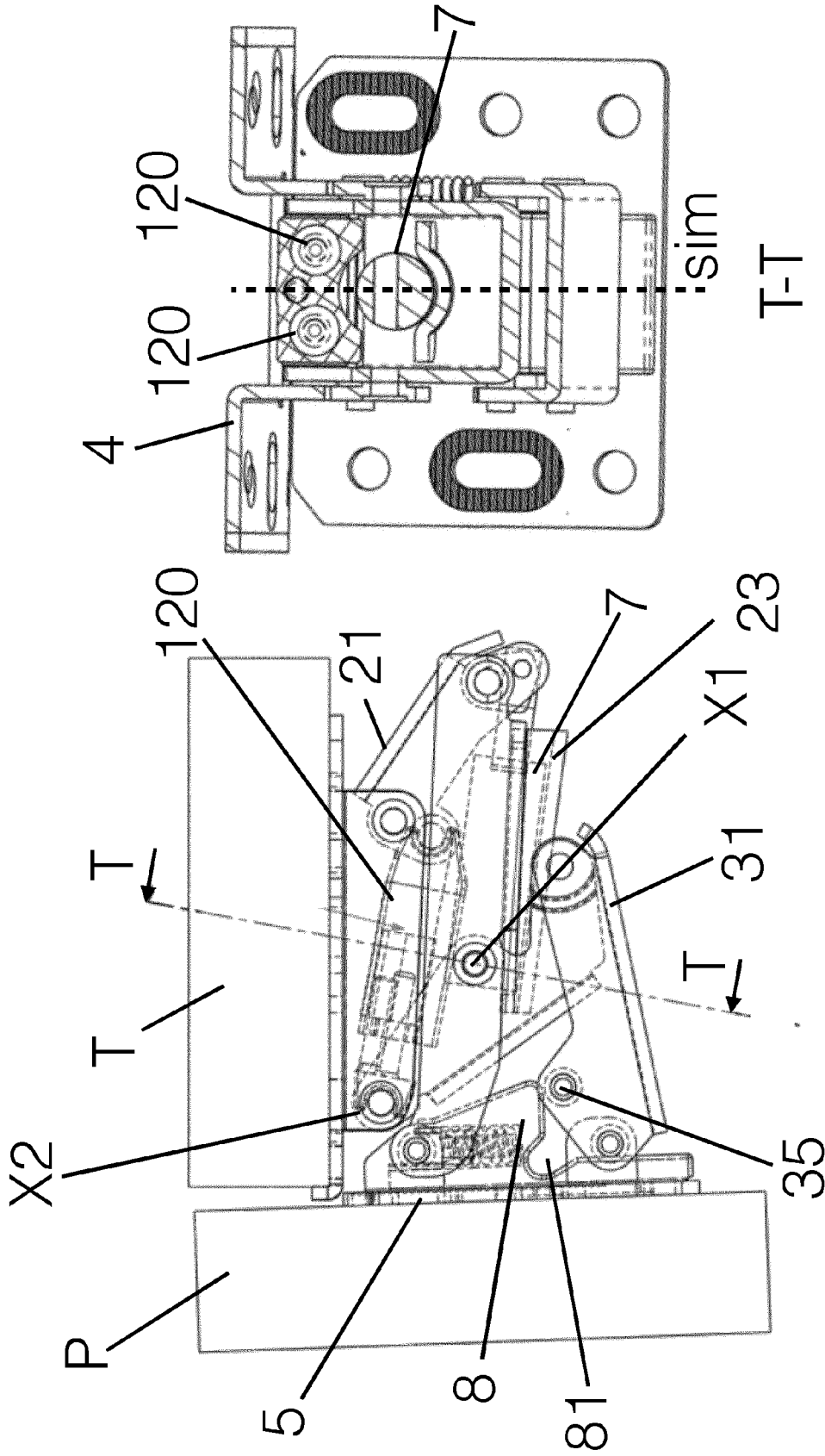


Fig. 10

Fig. 9



EUROPEAN SEARCH REPORT

Application Number  
EP 16 17 8196

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	* page 4, line 20 - page 5, line 6 * * figure 2 *		
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 18 November 2016	Examiner Wagner, Andrea
CATEGORY OF CITED DOCUMENTS 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		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	

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ANNEX TO THE EUROPEAN SEARCH REPORT  
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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