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### (54) HINGE AND SYSTEM COMPRISING A HINGE

(57) An aspect relates to a hinge comprising leaves, each leave comprising a mating member arranged to mate with a mating member in the other leave. In an embodiment, the mating members are arranged to mate in a direction substantially parallel to a plane of the leaves, with the hinge in closed state. With the two leaves connected for enabling a swiveling action, the mating members do not mate, for allowing the hinge to swivel. When a coupling element, such as a hinge pin, is removed from the hinge, the leaves are arranged to move relative to one another. If they move in a first direction relative to one another, the mating members mate. Due to the mating, the leaves are blocked from further relative movement in at least some direction other than opposite to the first direction. Preferably, movement in any direction other than opposite to the first direction.

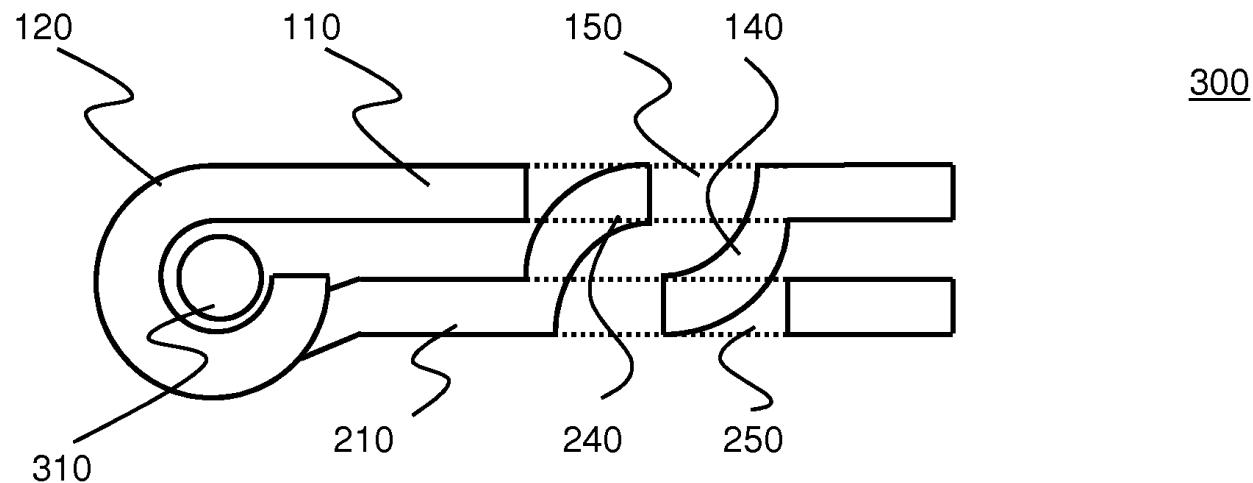


Fig. 3 A

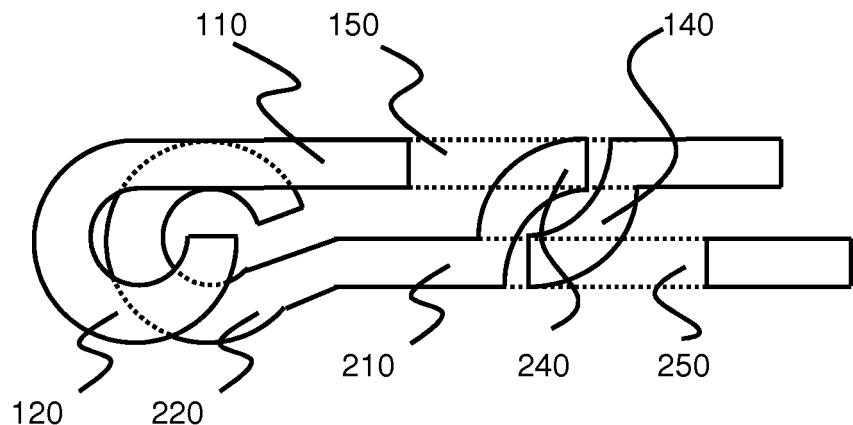


Fig. 3 B

## Description

### Technical field

**[0001]** The various aspects relate to security hinges.

### Background

**[0002]** Security hinges are widely used to prevent lifting of doors from frames. Common hinges, and mortise butt hinges in particular, can be taken apart with great ease by removing the hinge pin. Subsequently, a door may be lifted from a portal without opening the door first. To prevent such opening, security hinges are provided. A frame leaf is provided with a plug, extending in a direction perpendicular to the frame leaf. An accompanying door leaf is provided with a hole for receiving the plug, in a closed state of the hinge. In closed state, the plug extends through the hole in the door leaf and is accommodated by a hole provided in the door. Such hinge is for example disclosed by NL2006139.

### Summary

**[0003]** It is preferred to provide a safety hinge that does not require a hole as large as disclosed by NL2006139.

**[0004]** A first aspect provides a hinge comprising a first leaf and a second leaf, which first leaf and second leaf are connected to one another via a coupling element being arranged for enabling a swiveling movement over at least one swiveling axis, the coupling element being provided at a first end of the first leaf and at a first end of the second leaf. The first leaf comprising a first mating member of a first type, and the second leaf comprising a second mating member of a second type arranged to mate with the first mating member of the first type. The first mating member and second mating member are provided on the first leaf and the second leaf such that the first mating member and second mating member are aligned for mating, but not mating if the hinge is closed and the first leaf and the second leaf are coupled. Furthermore, the first mating member and second mating member are arranged to mate if the coupling element is removed and the first leaf and the second leaf are moved relative to one another in a first direction having a component parallel to the first leaf and the second leaf, the mating inhibiting further movement of the first leaf and the second leaf relative to one another in a further direction having a component perpendicular to the swiveling axis.

**[0005]** With the hinge, the mating substantially takes place in the plane of the first leaf and the second leaf, rather than in a direction perpendicular to that plane. This allows for more compact design of the hinge in directions perpendicular to the leafs. This means less space or in certain embodiments even no additional space is required in a door or a frame for accommodating mating members extending beyond the perimeter of the leafs of

the hinge. In the latter case, no hole in the portal is required. And such hinge still provides the security provided by hinges already known - or even better. It should be noted that whereas "door" is consistently used in the text, the various aspects and embodiments thereof may also be used in conjunction with windows or other panels for at least partially closing openings of buildings or other structures.

**[0006]** In an embodiment, the first leaf comprises a through hole for accommodating the second mating member if the hinge is in a closed state and the first leaf and the second leaf are aligned with one another. This embodiment allows for at least partial accommodation of the second mating member in the first leaf, rather than in a portal or door.

**[0007]** In another embodiment, the second leaf comprises a through hole for accommodating the first mating member if the hinge is in a closed state and the first leaf and the second leaf are aligned with one another. This embodiment allows for at least partial accommodation of the second mating member in the first leaf, rather than in a portal or door.

**[0008]** In a further embodiment, a second part of the first mating member connected to the first part of the mating member is provided parallel to the first leaf and at a second part of the second mating member is provided parallel to the second leaf. This embodiment allows for blocking in a direction perpendicular to the leaves with the mating members engaged.

**[0009]** In yet another embodiment, the female mating member comprises a dome-shaped indentation comprising an opening at least in a direction substantially perpendicular to the swiveling axis. This embodiment has an advantage that the leaf comprising the female mating member may be manufactured from, for example, a steel plate by cutting and/or pressing only - rather than by adding further components.

**[0010]** In yet a further embodiment, mating of the first mating member and second mating member, if mated, inhibits movement of the first leaf and the second leaf relative to one another in another direction having a component parallel to the swiveling axis. This embodiment provides further security, by further inhibiting movement.

**[0011]** In again another embodiment, The first leaf is a frame leaf and the second leaf is a door leaf; and the first direction is a direction wherein the first end of the door leaf extends beyond the first end of the frame leaf. This embodiment is advantageous for windows or doors moving outward from a building.

**[0012]** A second aspect provides a system comprising a door or a window and a frame for accommodating the door or the window, wherein the door or the window is connected to the frame by means of at least one hinge according to the first aspect.

**[0013]** In an embodiment of the second aspect, at least one of the door or window and the frame is at least partially provided with a liner comprising resilient material such that the door leaf and the frame leaf are biased

relative to one another towards the first direction.

**[0014]** In such embodiment, removal of the coupling element results in the first mating member and the second mating member to mate, thus securing the door and the frame.

#### Brief description of the drawings

**[0015]** The various aspect and embodiments thereof will now be discussed in conjunction with drawings. In the drawings,

- Figure 1: shows a frame leaf of a hinge;
- Figure 2: shows a door leaf of a hinge;
- Figure 3 A: shows a hinge comprising a hinge pin;
- Figure 3 B: shows a hinge without a hinge pin; and
- Figure 4: shows a door connected to a frame by means of a hinge.

#### Detailed description

**[0016]** Figure 1 shows a frame leaf 100 as part of a hinge for connecting a door or a window to a frame of a building, enabling the door or window to be opened by means of a swiveling movement. Figure 1 shows three views of the frame leaf 100, in three perspectives. The frame leaf 100 comprises a frame blade section 110 and, at a first end of the frame leaf 100, hinge shafts 120 for receiving a hinge pin.

**[0017]** The frame blade section 110 comprises holes 112 for receiving screws, bolts or other fastening means for connecting the frame leaf 100 to a portal of a building. The frame leaf 100 further comprises a female mating member 130 as a first mating member of a first type. The female mating member 130 comprises a dome-shaped receptacle 140 and a frame blade hole 150. The frame blade hole 150 is provided as a through-hole in the frame blade section 110, adjacent to the opening of the dome-shaped receptacle 140.

**[0018]** The opening of the dome-shaped receptacle 140 faces away from the hinge shafts 120. The dome-shaped receptacle 140 comprises a first part 142, close to the frame blade section 110, that is placed under a first angle relative to the frame blade section 110. The first angle is in this embodiment an obtuse angle, viewed from the hinge shafts 120. The top 144 of the dome-shaped receptacle 140 is substantially parallel to the frame blade section 110, at a distance from the frame blade section 110.

**[0019]** An advantage of the frame leaf 100 as shown by Figure 1 is that it may be manufactured by cutting and pressing of a single blade material, rather than by welding or otherwise joining additional elements to the frame blade section 110.

**[0020]** Figure 2 shows a door leaf 200 as part of a hinge for connecting a frame of a building to a door or a window, enabling the door or window to be opened by means of a swiveling movement. To the door or the window, pref-

erably the door leaf 200 shown by Figure 2 is provided. Figure 2 shows three views of the door leaf 200, in three perspectives. The door leaf 200 comprises a door blade section 210 and, at a first end of the door leaf 200, a hinge shaft 220 for receiving a hinge pin.

**[0021]** The door blade section 210 comprises holes 212 for receiving screws, bolts or other fastening means for connecting the door leaf 200 to a window or a door. The door leaf 200 further comprises a male mating member 230 as a second mating member of a second type. The male mating member 230 comprises a protrusion 240 and a door blade hole 250. The door blade hole 250 is provided as a through-hole in the door blade section 210, surrounding the protrusion 240.

**[0022]** The protrusion 240 points towards the hinge shaft 220. The protrusion 240 comprises a first part 242, close to the frame blade section 110, that is placed under a second angle relative to the door blade section 210. The second angle is in this embodiment an sharp angle, viewed from the hinge shaft 220. The end 244 of the protrusion 240 is substantially parallel to the door blade section 210, at a distance from the door blade section 210.

**[0023]** An advantage of the door leaf 200 as shown by Figure 2 is that it may be manufactured by cutting and pressing of a single blade material, rather than by welding or otherwise joining additional elements to the door blade section 210.

**[0024]** Figure 3 A shows a schematic representation of the door leaf 200 and the frame leaf 100. The door leaf 200 and the frame leaf 100 are connected by means of a hinge pin 310 as a part of a coupling element for coupling the frame leaf 100 and the door leaf 200. The end of the dome-shaped receptacle 140 is aligned with the end of the protrusion 240. Furthermore, the dome-shaped receptacle 140 is accommodated by the frame blade hole 250 and the protrusion 240 is accommodated by the door blade hole 150. The dome-shaped receptacle 140 and the protrusion 240 as complementary mating members are accommodated in opposite blades such that at the outer sides of the hinge 300, the hinge 300 is flush, with no protrusions protruding in a direction perpendicular to the leaf. In another embodiment, there may be some protrusions, although this is not preferred.

**[0025]** In another embodiment, the dome-shaped receptacle 140 is larger, extending beyond the frame blade 250. This allows the protrusion 240 to be provided in the plane of the frame blade 210. On the other hand, this increases the perimeter of the hinge 300 and may require modification of a frame to which the frame blade 210 is connected. Such modification may be providing a hole in the frame for accommodating a part of the dome-shaped receptacle 140.

**[0026]** In the constellation depicted by Figure 3 A, viewed in a direction perpendicular to the door leaf 200, the dome-shaped receptacle 140 does not overlap with the protrusion 240 with the door leaf 200 and the frame leaf 100 aligned and connected by means of the hinge

pin 310. This enables the hinge 300 to provide its intended swiveling function, with the end of the dome-shaped receptacle 140 not interfering with the end of the protrusion 240 during the swiveling operation of the hinge 300. Yet, the dome-shaped receptacle 140 and the protrusion 240 are aligned in a direction perpendicular to the hinge pin 310, hence in a direction perpendicular to the swiveling axis of the hinge 300.

**[0027]** In another embodiment, the edge of the receptacle 140 overlaps with the protrusion 240 with the frame leaf 100 and the door leaf 200 in the position as depicted by Figure 3 A. In such embodiment, the hinge shafts are positioned relative to the leaves such that with swiveling of the hinge 300, the edges of the receptacle 140 and the protrusion 240 do not interfere. As long as the swiveling of the hinge 300 is enabled, the receptacle 140 and the protrusion 240 are not characterised as to mate with one another.

**[0028]** Figure 3 B shows a schematic representation of the door leaf 200 and the frame leaf 100 with the hinge pin 310 removed. Furthermore, the door leaf 200 and the frame leaf 100 are skewed in a direction perpendicular to the hinge pin. In particular, the door leaf 200 and the frame leaf 100 are skewed such that the first end of the door leaf 200 extends beyond the first end of the frame leaf 100. In these positions of the frame leaf 100 and the door leaf 200, the protrusion 240 is received by the dome-shaped receptacle 140. The door leaf 200 and the frame leaf 100 may also be skewed in another direction.

**[0029]** In the position depicted by Figure 3 B, movement of the frame leaf 100 and the door leaf 200 relative to one another is blocked in another direction having a component parallel to the swiveling axis. Also movement of the frame leaf 100 and the door leaf 200 relative to one another is blocked in a direction having a component perpendicular to the frame blade section 110 and the door blade section 210. This means that in the position depicted by Figure 3 B, the frame leaf 100 and the door leaf 200 cannot be taken apart, despite absence of the hinge pin 310 and the frame leaf 100 is secured to the door leaf 200.

**[0030]** Figure 4 shows a schematic representation of a frame-door system 400 in a building. The frame-door system 400 comprises a frame 410, a door 420 and the hinge 300. Between the door 420 and the frame 410, a liner 430 is provided. Application of the liner 430 between the door 420 and the frame 410 is preferred for preventing drafts of air between the edges of the door 420 and the frame 410. The liner 430 comprises a resilient material. Such resilient material may be natural or synthetic rubber or another elastomer or another organic polymer having resilient properties. The liner 430 may comprise a foam material for enhancing resilience of the liner 430.

**[0031]** With the door 420 close, the liner 430 is preferably in a compressed state. This means that the door 420 is biased relative to the frame 410 in a direction that the door 420 is pushed out of the frame 410. The door 420 is kept at its proper position within the frame 410 by

means of the hinge 300 and the hinge pin 310 in particular. If the hinge pin is removed, the door 420 will be pushed out of the frame by virtue of the biasing force exercised by the liner 430. The pushing movement takes

5 place until the female mating member 130 provided in the frame leaf 100 mates with the male mating member 230 provided in the door leaf 200. With the female mating member 130 fully mated with the male mating member 230, no further movement of the door 420 and the frame 410 relative to one another is possible - except for a movement of the door 420 back into the frame 410.

**[0032]** Various modifications of a general concept provided by the claims are possible, as variations based on the embodiments discussed above. First, whereas the frame leaf 100 has been shown having two hinge shafts 120 and the door leaf has been shown with one hinge shaft 220, the amount and constellation of the hinge shafts may be implemented differently. It is preferred the positions of the hinge shafts on the leafs is complementary, allowing proper coupling of the frame leaf 100 and the door leaf 200. Optionally, some space may be provided between adjacent ends of hinge shafts to provide room for a bearing, yet also in this embodiment the positions of the hinge shafts may be considered to be complementary. Furthermore, whereas the embodiments have been discussed in conjunction with a mortise butt hinge, also other hinges may be modified to employ the various aspects discussed and embodiments thereof. Such other hinges preferably comprise two blades that are provided parallel to one another if the door, window or other panel is in a closed state, like a mortise butt hinge, a piano hinge, similar hinges, either existing or to developed as new. If a film hinge is used, no hinge pin 130 is present. In such embodiment, the coupling element comprises a film.

**[0033]** In the embodiments discussed above, the female mating member 130 is presented comprising a dome-shaped receptacle 140 and a frame blade hole 150. Alternatively, the female mating member does not 40 comprise the dome-shaped receptacle 140, but only a section that is placed under an angle relative to the frame blade section 110, preferably an obtuse angle, viewed from the hinge shafts 120. Such section may be open in directions parallel to the hinge shafts. The male mating member 230 may be modified accordingly.

**[0034]** Furthermore, the female mating member 130 and the male mating member 230 may be interchanged between the frame leaf 100 and the door leaf 200. Preferably, with the male mating member 230 applied to the frame leaf 100 and the female mating member 130 applied to the door leaf 200, the mating members are rotated 180 degrees or mirrored over an axis parallel to the hinge shafts. This transformation is preferably executed to preserve the functionality of the hinge 300 as discussed in conjunction with Figure 4. In yet another alternative, the frame blade 100 and the door blade 200 both comprise male and female mating members. These do not necessarily have to be identical female mating members and

identical male mating members. Yet is it preferred that first mating members of a first type provided comprised by the frame blade 100 are arranged to mate with mating second members of a second type comprised by the door blade 200.

**[0035]** In summary, one aspect relates to a hinge comprising leaves, each leaf comprising a mating member arranged to mate with a mating member in the other leaf. In an embodiment, the mating members are arranged to mate in a direction substantially parallel to a plane of the leaves, with the hinge in closed state. With the two leaves connected for enabling a swiveling action, the mating members do not mate, for allowing the hinge to swivel. When a coupling element, such as a hinge pin, is removed from the hinge, the leaves are arranged to move relative to one another. If they move in a first direction relative to one another, the mating members mate. Due to the mating, the leaves are blocked from further relative movement in at least some direction other than opposite to the first direction. Preferably, movement in any direction other than opposite to the first direction.

**[0036]** Expressions such as "comprise", "include", "incorporate", "contain", "is" and "have" are to be construed in a non-exclusive manner when interpreting the description and its associated claims, namely construed to allow for other items or components which are not explicitly defined also to be present. Reference to the singular is also to be construed in be a reference to the plural and vice versa.

**[0037]** In the description above, it will be understood that when an element such as layer, region or substrate is referred to as being "on" or "onto" another element, the element is either directly on the other element, or intervening elements may also be present.

**[0038]** Furthermore, the invention may also be embodied with less components than provided in the embodiments described here, wherein one component carries out multiple functions. Just as well may the invention be embodied using more elements than depicted in the Figures, wherein functions carried out by one component in the embodiment provided are distributed over multiple components.

**[0039]** A person skilled in the art will readily appreciate that various parameters disclosed in the description may be modified and that various embodiments disclosed and/or claimed may be combined without departing from the scope of the invention.

## Claims

1. Hinge comprising a first leaf and a second leaf, which first leaf and second leaf are connected to one another via a coupling element being arranged for enabling a swiveling movement over at least one swiveling axis, the coupling element being provided at a first end of the first leaf and at a first end of the second leaf,

The first leaf comprising a first mating member of a first type; and

The second leaf comprising a second mating member of a second type arranged to mate with the first mating member of the first type;

Which first mating member and second mating member are provided on the first leaf and the second leaf such that:

- The first mating member and second mating member are aligned for mating, but not mating if the hinge is closed and the first leaf and the second leaf are coupled; and

- The first mating member and second mating member are arranged to mate if the coupling element is removed and the first leaf and the second leaf are moved relative to one another in a first direction having a component parallel to the first leaf and the second leaf, the mating inhibiting further movement of the first leaf and the second leaf relative to one another in the a further direction having a component perpendicular to the swiveling axis.

- 25 2. Hinge according to claim 1, wherein the first leaf comprises a through hole for accommodating the second mating member if the hinge is in a closed state and the first leaf and the second leaf are aligned with one another.
- 30 3. Hinge according to claim 1 or 2, wherein the second leaf comprises a through hole for accommodating the first mating member if the hinge is in a closed state and the first leaf and the second leaf are aligned with one another.
- 35 4. Hinge according to any of the claims 1 to 3, wherein at least a first part of the first mating member is placed under a first angle relative to the first blade and at least a first part of the second mating member is placed under a second angle relative to the second blade, a first of the first angle and the second angle being obtuse, relative to the first end and a second of the first angle and the second angle being sharp, relative to the first end.
- 40 5. Hinge according to any of the claims 1 to 4, wherein a second part of the first mating member is provided parallel to the first leaf and a second part of the second mating member is provided parallel to the second leaf.
- 45 6. Hinge according to claim 5, wherein the second part of the first mating member is provided spaced apart from the first leaf and the second part of the second mating member is provided spaced apart from the second leaf.

7. Hinge according to any of the preceding claims, wherein a first of the first mating member and the second mating member comprises a female mating member and a second of the first mating member and the second mating member comprises a male mating member. 5

8. Hinge according to claim 7, wherein the female mating member comprises a dome-shaped indentation comprising an opening at least in a direction substantially perpendicular to the swiveling axis. 10

9. Hinge according to any of the claims 6 to 8, wherein the male mating member comprises a protrusion. 15

10. Hinge according to claim 9, wherein the protrusion placed parallel to the first leaf, in the plane of the first leaf.

11. Hinge according to any of the preceding claims, wherein mating of the first mating member and second mating member inhibits movement of the first leaf and the second leaf relative to one another in another direction having a component parallel to the swiveling axis. 20 25

12. Hinge according to any of the preceding claims, wherein:

- The first leaf is a frame leaf and the second leaf is a door leaf; and
- The first direction is a direction wherein, after movement in the first direction, the first end of the door leaf extends beyond the first end of the frame leaf. 30 35

13. Hinge according to any of the preceding claims, wherein the first leaf comprises a first set of at least one hinge shaft and the second leaf comprises a second set of at least one hinge shaft, the hinge shafts of the first set and the second set being complementary such that with the first leaf and the second leaf being aligned, the hinge shafts of the first set and the second set form a common shaft for accommodating a hinge pin as a coupling element. 40 45

14. System comprising a door or a window and a frame for accommodating the door or the window, wherein the door or the window is connected to the frame by means of at least one hinge according to any of the preceding claims. 50

15. System according to claim 14, wherein at least one of the door or window and the frame is at least partially provided with a liner comprising resilient material such that the door leaf and the frame leaf are biased relative to one another towards the first direction. 55

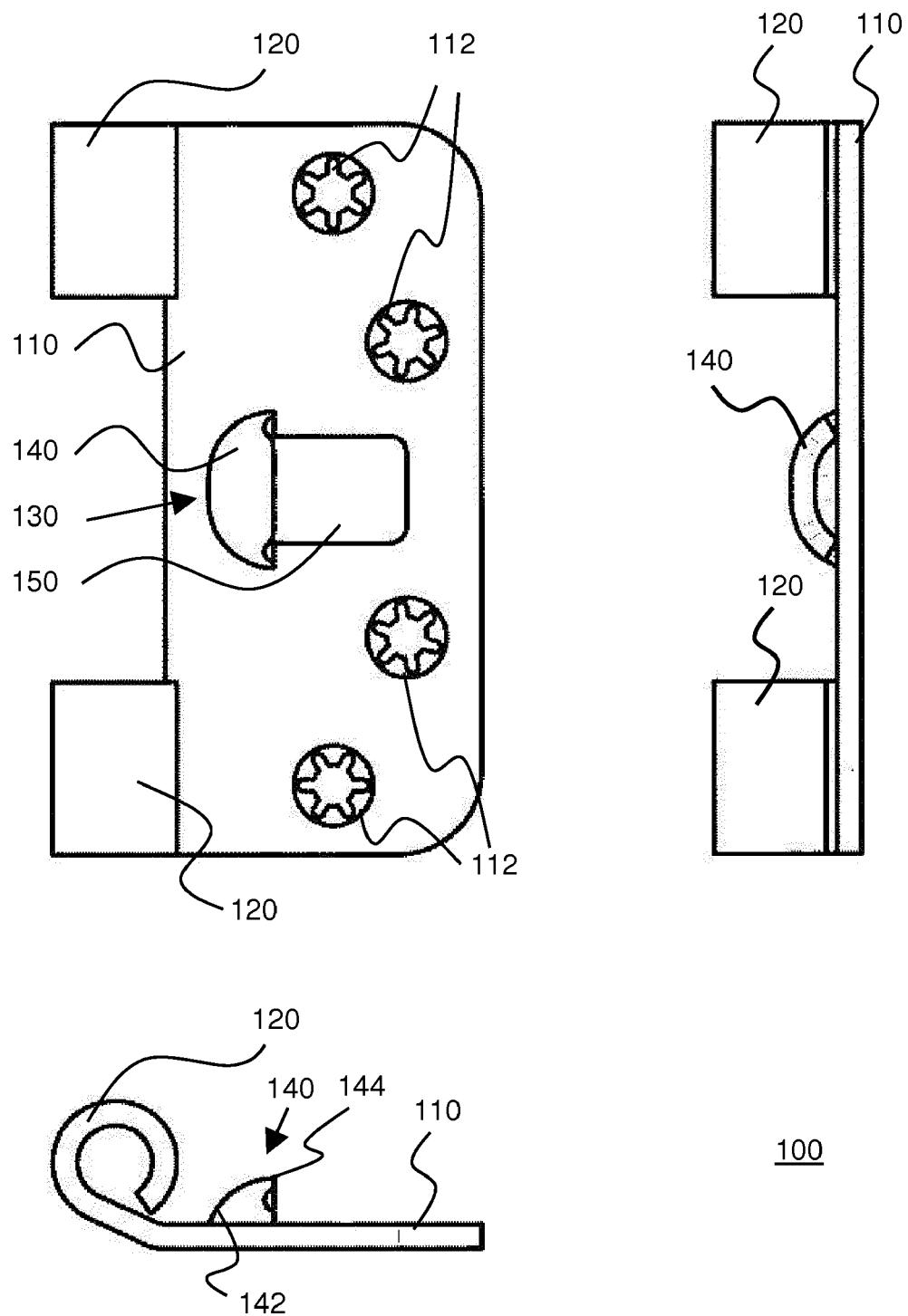


Fig. 1

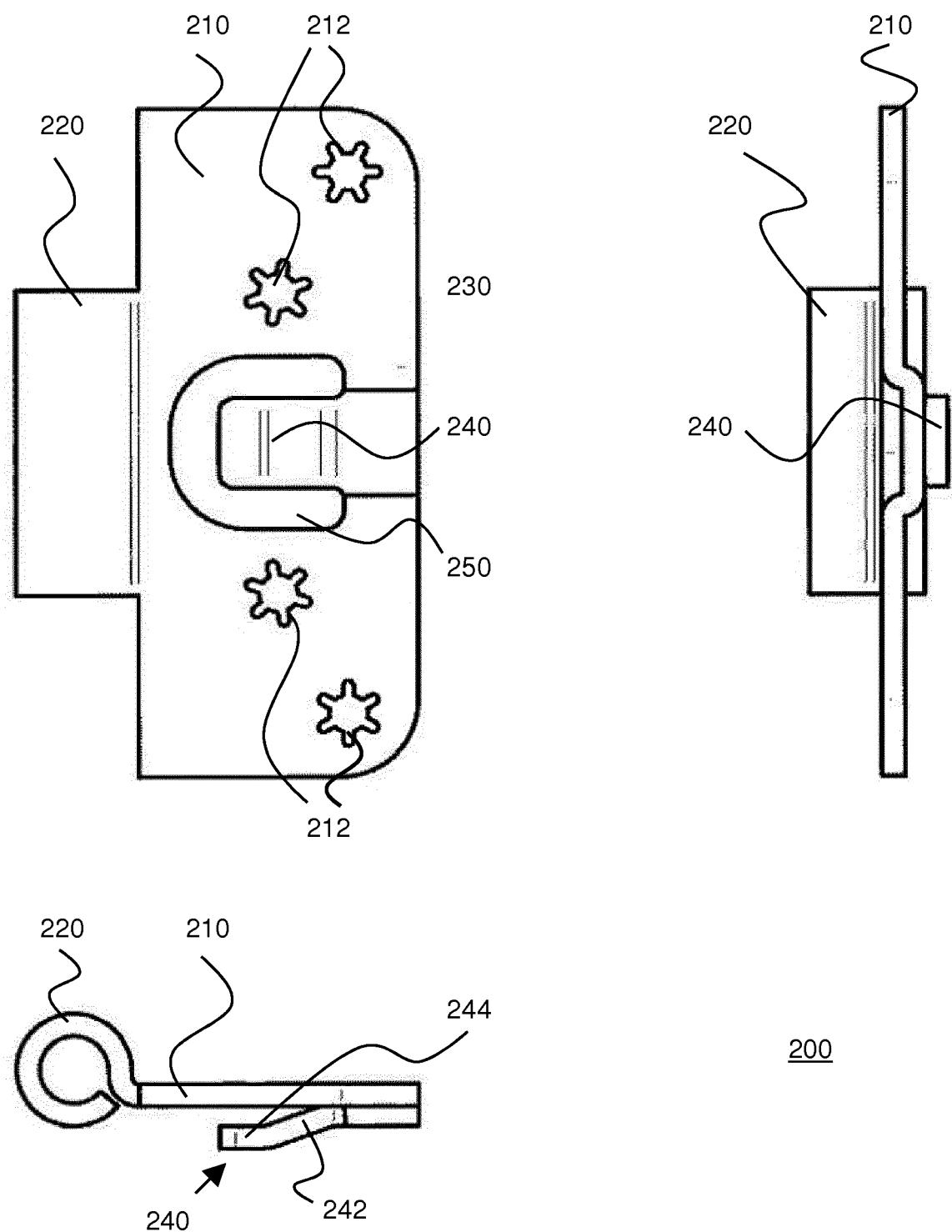


Fig. 2

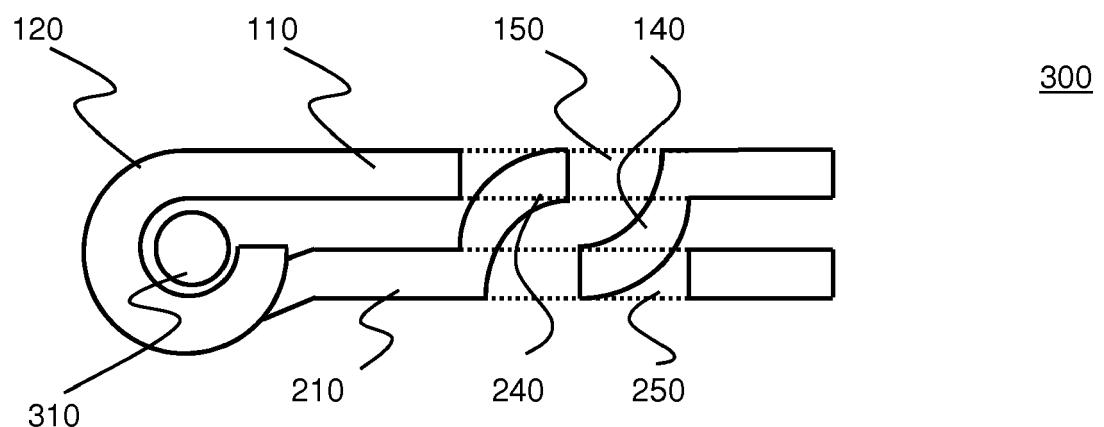


Fig. 3 A

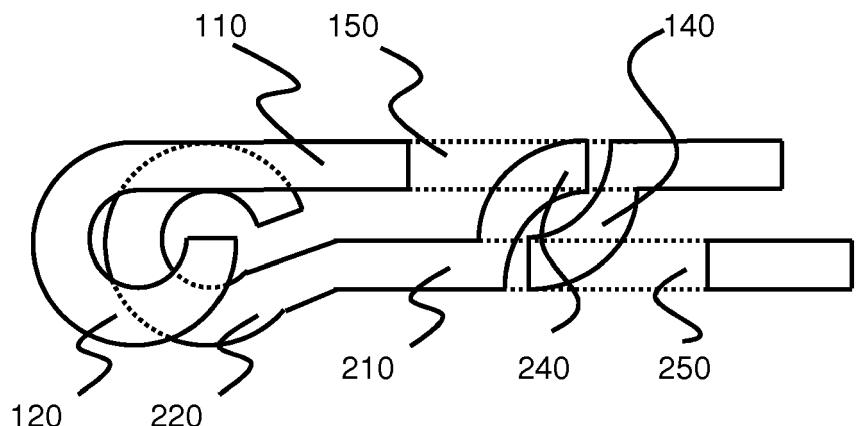


Fig. 3 B

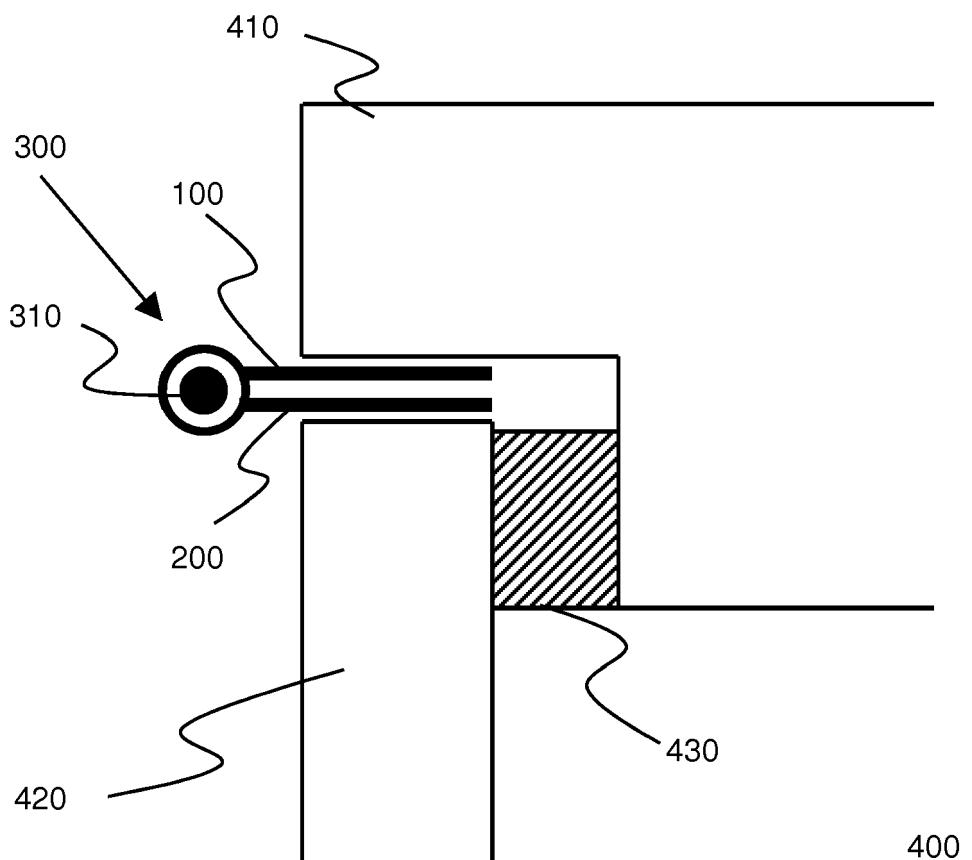


Fig. 4



## EUROPEAN SEARCH REPORT

Application Number

EP 17 16 4742

5

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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35			E05D
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50 1	The present search report has been drawn up for all claims		
55	Place of search The Hague	Date of completion of the search 4 August 2017	Examiner Berote, Marc
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10	Patent document cited in search report	Publication date	Patent family member(s)		Publication date		
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