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(71) Applicant: **CJM Lasmekanik AB**
723 46 Vasteras (SE)

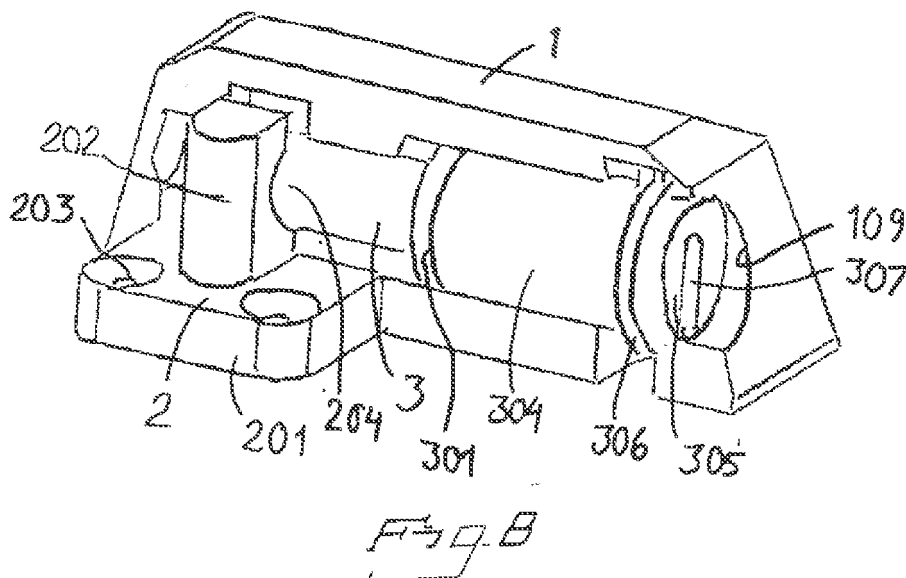
(72) Inventor: **Jönsson, Leif**
723 46, Västerås (SE)

(74) Representative: **Karlsson, Leif Karl Gunnar**
Groth & Co KB
Box 6107
102 32 Stockholm (SE)

(54) **Security lock**

(57) The invention concerns a security lock having a first lock part (1) and a second lock part (2) to be attached to a door and a doorframe, respectively. The first lock part (1) has a housing having a lock cylinder and a turnable bolt (3) and the second lock part (2) has a lock body (202).

According to the invention, the bolt (3) has a locking portion having different cross-section thickness in different turning positions. The lock body (202) has a slot (204) having a wide inner part and a narrower outer part, wherein the bolt (3) can be brought through the outer part in a first turning position but not in a second turning position.



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Description

Background of the Invention

[0001] The present invention relates to a security lock comprising a first lock part intended to be attached to a door or the like and a second lock part intended to be attached to a doorframe or the like for the co-operation with the first lock part, which first lock part comprises a housing having a lock cylinder and a bolt turnable around a turn axis and that is connected with the lock cylinder and turnable by means of a key, and which second lock part comprises a lock body.

Background of the Invention

[0002] A security lock has to be constructed so that it meets very high security requirements against someone unduly forcing the same and comply with the standards that have been established for different classes of security locks. This entails that existing locks of this type are relatively complicated in their design and thereby expensive. Therefore, there is a need of providing simpler designs of security lock.

[0003] An object of the present invention is to provide for this need and accordingly provide a security lock that combines a simple design with heavy demands on security.

Summary of the Invention

[0004] According to the present invention, the object set forth is attained by the fact that a security lock of the kind mentioned by way of introduction has the special features

- that the bolt has a locking portion that, perpendicular to the turning axis of the bolt, has a non-uniform cross-sectional profile having a greater thickness in a first direction and a smaller thickness in a second direction, perpendicular to the first direction,
- and that the lock body has a slot having two side openings, a front opening and a bottom, which slot has an outer part at the front opening and an inner part at the bottom, which outer part has a width that is greater than said smaller thickness but is less than said greater thickness, and which inner part has a width that is greater than said greater thickness, whereby
- the bolt, in a first turning position, can pass in the cross-direction through the outer part of the slot, but not in a second turning position, forming a right angle with the first turning position.

[0005] By virtue of the profiled portion of the bolt in co-operation with the specially formed slot in the lock body, a very efficient and reliable locking can be provided. Locking is carried out in a simple way by the profiled portion

being introduced into the slot at an angle position where its smaller thickness allows this. When the bolt has been inserted in this way, arresting is easily effected by turning the lock body 90°. In this position, the bolt is firmly clamped. By virtue of the simplicity of the co-operating elements, the same can be made sturdy and robust without the lock in its entirety needing to become particularly bulky. In addition, the mechanism becomes entirely contained in the housing and is protected from damage from outside. Thereby, the lock becomes almost impossible to force unduly.

[0006] In the present application, by cross-direction, a direction perpendicular to the turning axis of the bolt is intended, and by cross-sectional profile, a profile in a plane perpendicular to said turning axis is intended.

[0007] According to a preferred embodiment of the invention, the locking portion has a cross-sectional profile that is limited by at least one circular arc and at least one straight line.

[0008] Such a cross-sectional profile allows that the two different thicknesses of the locking portion are provided in a simple way by milling from a circular starting profile.

[0009] According to an additional preferred embodiment, the locking portion is formed of two diametrically opposite equally large recesses having plane bottom in a cylindrical bolt.

[0010] This entails that the profile becomes symmetrical as for its greater thickness as well as its smaller thickness. This means increased simplicity and optimized load-carrying capacity.

[0011] According to an additional preferred embodiment, the slot is symmetrical in relation to a normal to the turning axis of the bolt and has a cross-sectional profile that is formed of a circular arc having an extension of more than 240° and two straight lines that connect the circular arc with the front opening, the circular arc forming said bottom and said inner part and the two straight lines forming said outer part, which circular arc has a radius that is somewhat greater than the circular arc of the profile of the locking portion.

[0012] Thereby, the inner part obtains a profile that is easy to produce and that is well adapted to preferred embodiments of the bolt. By virtue of the inner part by a wide margin surrounding more than 180°, it is guaranteed in a simple way that the outer part obtains a smaller thickness than the inner part for a reliable locking action. The symmetry facilitates manufacture as well as handling of the lock.

[0013] According to an additional preferred embodiment, the circular arc has an extension in the interval of 270°-300°.

[0014] The most suitable balancing for providing an appropriate ratio between the greater and the smaller thickness is within this interval. The difference between the same becomes sufficiently great in order to, by a comfortable margin, prevent the lock plunger from being movable outward through the slot in the locked position. Si-

multaneously, the smaller thickness will be sufficiently great to accommodate a material thickness great enough in the thinner profile direction that is required from a strength point of view.

[0015] According to an additional preferred embodiment, the two straight lines of the cross-sectional profile of the slot diverge out toward the front opening.

[0016] The divergence results in a guiding-in action when the bolt is to be introduced through the slot.

[0017] According to an additional preferred embodiment, the lock body is arranged on a fastening plate, and the housing of the first part on the side that faces the second part when the lock parts are interconnected has a depression having a contour corresponding to the contour of the fastening plate and a depth corresponding to the depth of the fastening plate.

[0018] Thereby, the housing of the first lock part can, in the locked position, entirely surround the second lock part, which makes that the locking mechanism becomes entirely contained, which further contributes to high security.

[0019] According to an additional preferred embodiment, the housing has a fastening side by which it is intended to be attached to a door or the like, an opposite outside, and side surfaces connecting the fastening side with the outside, said side surfaces sloping outward from the outside toward the fastening side.

[0020] Thanks to the fact that the side surfaces slope in this way, the possibility of applying a tool to the housing in order to break the lock is made more difficult.

[0021] The side surfaces slope suitably at an angle in the interval of 15-25° to a normal to the plane of the outside.

[0022] According to an additional preferred embodiment

- the bolt and the lock plunger are arranged in a boring having an inner end and an outer end,
- a freely rotatable protective plate having a key slot covers the outer end of the lock plunger,
- a stop pin is arranged in the boring next to the inner end thereof, which stop pin is displaceable in a hole perpendicular to the longitudinal axis of the bolt, which hole mouths on the fastening side of the housing, and against which stop pin the inner end of the bolt abuts,
- the housing has an opening for the protective plate having a smaller diameter than the protective plate
- a protective plate hole is recessed on the fastening side of the housing, which hole has an elongate cross-sectional shape, having a width that is greater than the thickness of the protective plate and a length that is greater than the diameter of the protective plate, and with the longitudinal direction perpendicular to the longitudinal axis of the bolt
- the spacing between the side of the stop pin abutting against the inner end of the bolt and the inner end of the boring is greater than the spacing between the

inside of the protective plate and the axially inner limiting surface of the protective plate hole so that the lock package is displaceable toward the inner end of the boring at least a distance corresponding to the spacing between the inside of the protective plate and the axially inner limiting surface of the protective plate hole.

[0023] By this embodiment, it is guaranteed that the protective plate cannot be dismounted from the lock when the same is locked, which further increases the security. The protective plate prevents the possibility of unduly gaining access to the lock cylinder. Easy mounting of the protective plate is allowed.

[0024] The invention also concerns a lockable unit having walls and a door, which surround a delimited space and which unit is provided with a security lock according to invention, preferably according to any one of the preferred embodiments of the same.

[0025] The invented lockable unit has advantages that follow from the advantages of the invented security lock and the preferred embodiments of the same, and that have been accounted for above.

[0026] The above-mentioned preferred embodiments are defined in the claims depending on claim 1.

[0027] The invention is explained in more detail by the subsequent detailed description of an embodiment example of the same, reference being made to the appended figures.

Brief Description of the Figures

[0028]

- Fig. 1 is a section through a first lock part.
- Fig. 2 is a view from the underside of the lock part in Fig. 1.
- Fig. 3 is a side view of the lock part in Fig. 1.
- Fig. 4 is a perspective view of a second lock part.
- Fig. 5 is a side view of a bolt of the lock.
- Fig. 6 is a section through co-operating lock parts in a first turning position.
- Fig. 7 is a section similar to the one in Fig. 6 and shows a second turning position.
- Fig. 8 is an exploded view in perspective of the lock.
- Fig. 9 is a perspective view of a lockable unit provided with the lock.

Description of Embodiment Example

[0029] The security lock that is illustrated in the figures consists of three main components, namely a first lock part 1, a second lock part 2 and a bolt 3 having a lock cylinder.

[0030] Figs. 1-3 show the first lock part 1 that is intended to be attached to the door of the unit to which the security lock has been applied.

[0031] Fig. 1 shows a longitudinal section through the

lock part 1 having a gold bar-like shape. Accordingly, the lock part is limited by two parallel opposite rectangular sides 101, 102 and four sloping sides 103-106 that connect the same with each other. The lower side in the figure constitutes the fastening side 101 of the lock and is somewhat larger than the opposite outside 102.

[0032] A boring extends in the longitudinal direction through the lock part 1 from one of the short side surfaces 103 thereof. The boring has a first portion 107 and a second portion 108, where the first portion 107 has a greater diameter than the second portion 108. The first portion 107 is intended to contain a lock cylinder and the second portion is intended to contain a bolt that is turnably manoeuvrable by the lock plunger. A short distance from the mouth of the boring in the side surface 103, there is a short portion 109 of the boring having a somewhat greater diameter than the first portion 107 that surrounds the lock cylinder. The short portion 109 is intended to house a protective plate.

[0033] On the fastening side 101 of the lock part 1, there is a shallow recess 110 and from the recess 110, a deeper recess 111 extends inward toward the second portion 108 of the boring and past the same. The recesses 110, 111 are intended to house the second lock part 2 in the locked state. From the recess 110, a transverse hole 113 is furthermore recessed, which extends in to the second portion 108 of the longitudinal boring at the inner end thereof.

[0034] On the fastening side 101 of the lock part, there is in addition a recess 112 at the short portion 109 of the boring, and that extends inward toward and somewhat past the same portion.

[0035] In Fig. 2, which shows the fastening side 101 of the lock part 1, the contours of the respective recesses 110, 111, 112 and the position of the hole 113 are seen. In the figure, the threaded drill holes 114, by means of which the lock part 1 is attached to the door, are also seen. The lock part 1 is screwed on to the door in such a way that only the left part of the fastening side 101 in the figure abuts against the door while the right part having the recess 110 is exposed to be able to be co-operate with the second lock part 2, which is attached to the door frame.

[0036] Fig. 3 shows the first lock part 1 in an end view from the side surface 103 in which the longitudinal boring 107, 108 mouths.

[0037] The second lock part 2 is shown in a perspective view in Fig. 4 and has a fastening plate 201 and a lock body 202. The fastening plate has four holes 203 for the screwing-on of the lock part 2 to a doorframe.

[0038] The fastening plate 201 has a contour that corresponds to the contour of the recess 110 in the first lock part and a thickness that corresponds to the depth of the same recess 110 or is somewhat thicker, wherein generally the entire second lock part 2 can be received in the recesses 110, 111 of the first lock part 1, which is the case when the security lock is locked. The lock body 202 has a slot 204 intended to receive the bolt arranged in

the first lock part 1. The slot has a keyhole-like cross-section contour that is illustrated in more detail in Figs. 6 and 7.

[0039] Fig. 5 shows the bolt 3 in a side view. It is cylindrical having a diameter that corresponds to the diameter of the second portion 108 of the boring of the first lock part 1. At the right end thereof in the figure, the bolt 3 is provided with a flange 301 having a rectangular recess 302, by means of which recess 302 the bolt is rotationally fixedly connected with the lock cylinder.

[0040] A short distance from the left end of the bolt 3 in the figure, the bolt has a locking portion 303 formed by two diametrically opposite milled-out cavities. Accordingly, the locking portion 303 has different cross-section dimensions in cross-directions perpendicular to each other, corresponding to the diameter of the bolt in one cross-direction and the corresponding to the spacing between the plane bottoms of the milled-out cavities in the other cross-direction. How the locking portion co-operates with the second lock part 2 is seen in Figs. 6 and 7.

[0041] Figs. 6 and 7 show the locking portion 303 of the bolt 3 in a position inside the lock body 202 of the second lock part 2 in a section perpendicular to the turning axis of the bolt. In Fig. 6, the lock is unlocked and in Fig. 7 it is locked.

[0042] The slot 204 has an outer part 205 and an inner part 206. The inner part is circular and surrounds approximately $\frac{3}{4}$ of the circumference of the circle. The outer part 205 is formed of two opposite plane walls 207 that meet the inner part 206 at a web portion 208 and that diverge outward toward the front opening 209 of the slot.

[0043] Because of the two opposite milled cavities, the locking portion 303 of the bolt has an elongate cross-sectional profile having a thickness that is somewhat smaller than the width of the web portion. Accordingly, the locking portion 303 of the bolt can be brought in and out through the slot in the turning position shown in Fig. 6. When the lock is locked as in the turning position shown in Fig. 7b, the locking portion 303 of the bolt is blocked from being bringable out of the slot 204 in the cross-direction, since the width of the web portion 208 is smaller than the diameter of the bolt 3.

[0044] Fig. 8 is a perspective view of the entire security lock where the housing of the first part 1 is partly cut away. The figure shows the two parts of the lock in locking position, with the bolt 3 extending through the inner part 206 of the slot of the lock body 202. By the flange 301 thereof, the bolt 3 is rotationally fixedly connected with the lock cylinder 304, which at the outer end thereof is covered by a freely rotatable protective plate 305.

[0045] The lock cylinder situated next to the cylinder cover 304 is turned in a conventional way by a key that is introduced through the key slot 307 in the protective plate 305. By the turning of the key, the locking portion of the bolt can thereby be brought to assume either of the positions that are illustrated in Figs. 6 and 7.

[0046] The protective plate 305 has an inner part 306 having a greater diameter situated in the shorter portion

109 having a greater diameter than the other parts of the boring. Thereby, the protective plate 305 cannot be removed from the first lock part 1.

[0047] The axial travel of the bolt is limited inward by a stop pin (not shown) arranged in the hole 113 (see Fig. 1). Mounting and of the protective plate is carried out by displacing the bolt 3 and the lock cylinder inward toward the bottom of the boring 108 of the bolt before the stop pin is inserted into the hole 113. Thereby, the lock cylinder with the cover 304 thereof is displaced inward so that it is situated axially inside the slot 112 (see Fig. 1), wherein the protective plate 305 can be introduced in place through the slot 112. Then the entire package is displaced outward and the stop pin is introduced through the hole 113. Removal of the protective plate 305 can only be made when the lock part 1 is dismounted from the door.

[0048] Fig. 9 shows the security lock mounted on a lockable unit 4 with the first lock part 1 on the door 42 and the second lock part 2 on the door frame 41. The design of the lock allows it to be used for left-hand as well as right-hand doors.

Claims

1. Security lock comprising a first lock part (1) intended to be attached to a door (42) or the like and a second lock part (2) intended to be attached to a doorframe (41) or the like for the co-operation with the first lock part (1), which first lock part (1) comprises a housing having a lock cylinder and a bolt (3) turnable around a turn axis and that is connected with the lock cylinder and turnable by means of a key, and which second lock part (2) comprises a lock body (202), **characterized in that**

- that the lock body (202) is arranged on a fastening plate (201) and that the housing of the first part (1) on the side (101) that faces the second part (2) when the lock parts are interconnected has a depression (110) having a contour corresponding to the contour of the fastening plate (201) and a depth corresponding to the depth of the fastening plate (201), which depression (110) is arranged to surround the fastening plate (201) when the lock parts are interconnected,
- and a deeper recess (111) in the first part (1) and mouting in said depression, which recess (111) is arranged to surround the lock body (202) when the lock parts are interconnected,
- the bolt (3) has a locking portion (303) that, perpendicular to the turning axis of the bolt (3), has a non-uniform cross-sectional profile having a greater thickness in a first direction and a smaller thickness in a second direction perpendicular to the first direction,
- and **in that** the lock body (202) has a slot (204)

having two side openings, a front opening (203) and a bottom, which slot (204) has an outer part (205) at the front opening and an inner part (206) at the bottom, which outer part (205) has a width that is greater than said smaller thickness but is less than said greater thickness, and which inner part (206) has a width that is greater than said greater thickness, whereby

- the bolt (3), in a first turning position, can pass in the cross-direction through the outer part (205) of the slot (204), but not in a second turning position, forming a right angle with the first turning position.

2. Security lock according to claim 1, **characterized in that** the locking portion (303) has a cross-sectional profile that is limited by at least one circular arc and at least one straight line.
3. Security lock according to claim 2, **characterized in that** the locking portion (303) is formed of two diametrically opposite equally large recesses having bottom in a cylindrical bolt.
4. Security lock according to any one of claims 2-3, **characterized in that** the slot (204) is symmetrical in relation to a normal to the turning axis of the bolt (3) and has a cross-sectional profile that is formed of a circular arc (206) having an extension of more than 240° and two straight lines (207) that connect the circular arc with the front opening (209), the circular arc forming said bottom and said inner part and the two straight lines (207) forming said outer part (205), which circular arc (206) has a radius that is somewhat greater than the circular line of the profile of the locking portion (303).
5. Security lock according to claim 4, **characterized in that** the circular arc (206) has an extension in the interval of 270°-300°.
6. Security lock according to claims 4 or 5, **characterized in that** the two straight lines (207) of the cross-sectional profile of the slot (204) diverge from the circular arc (206) out toward the front opening (209).
7. Security lock according to any one of claims 1-6, **characterized in that** the housing has a fastening side (101) by which it is intended to be attached to a door or the like, an opposite outside (102), and side surfaces (103-116) connecting the fastening side (101) with the outside (102), said side surfaces (103-116) sloping outward from the outside toward the fastening side.
8. Security lock according to any one of claims 1-7, **characterized in that**

- the bolt (3) and the lock plunger are arranged in a boring (107, 108) having an inner end and an outer end,
 - that a freely rotatable protective plate (305) having a key slot (307) covers the outer end of the lock plunger, 5
 - that a stop pin is arranged in the boring (108) next to the inner end thereof, which stop pin is displaceable in a hole (113) perpendicular to the longitudinal axis of the bolt, which hole (113) 10
 - mouths on the fastening side (101) of the housing, and against which stop pin the inner end of the bolt (3) abuts,
 - that the housing has an opening for the protective plate (305) having a smaller diameter than the protective plate (305) 15
 - that a protective plate hole (112) is recessed on the fastening side of the housing, which hole (112) has an elongate cross-sectional shape, having a width that is greater than the diameter 20
 - of the protective plate (305), and with the longitudinal direction perpendicular to the longitudinal axis of the bolt (3)
 - that the spacing between the side of the stop pin abutting against the inner end of the bolt (3) 25
 - and the inner end of the boring (108) is greater than the spacing between the inside of the protective plate (305) and the axially inner limiting surface of the protective plate hole (112), so that 30
 - the lock package is displaceable toward the inner end of the boring (108) at least a distance corresponding to the spacing between the inside of the protective plate (305) and the axially inner limiting surface of the protective plate hole. 35
9. Lockable unit (4) comprising walls and a door (42), which surround a delimited space, **characterized in that** the unit is provided with a security lock according to any one of claims 1-8. 40

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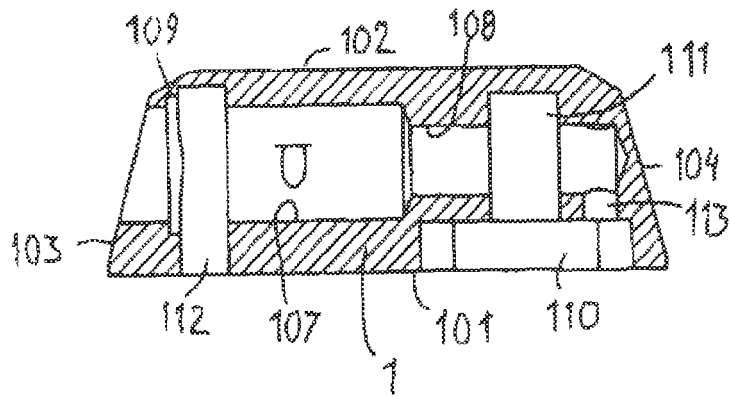


Fig. 1

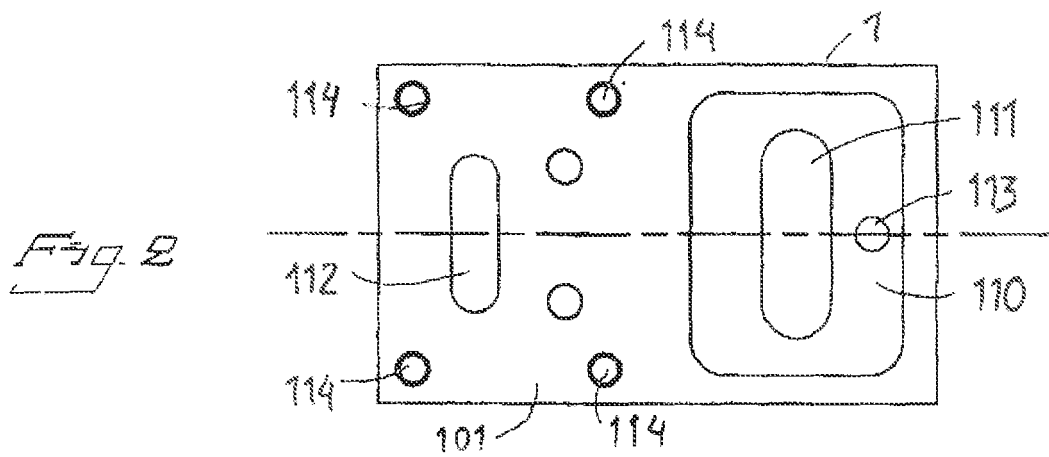


Fig. 2

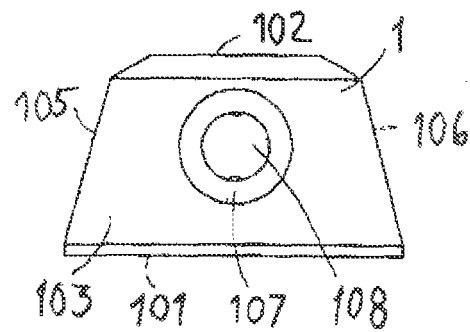
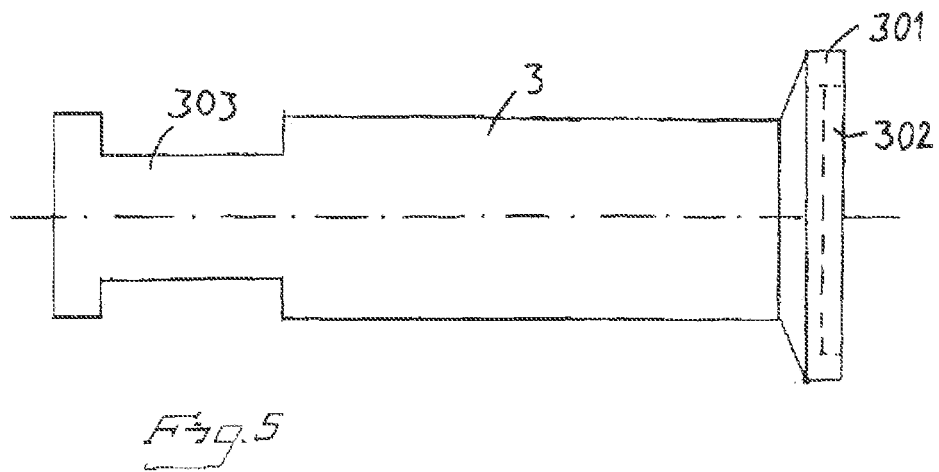
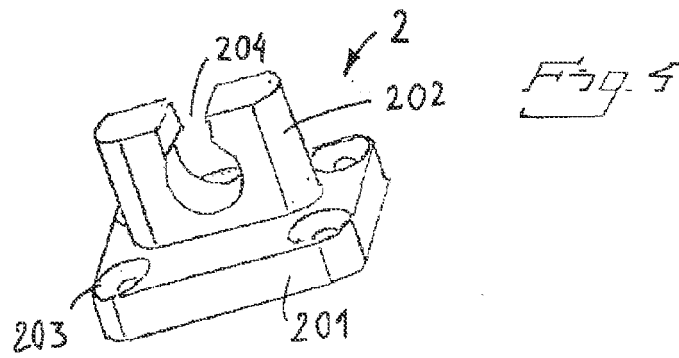
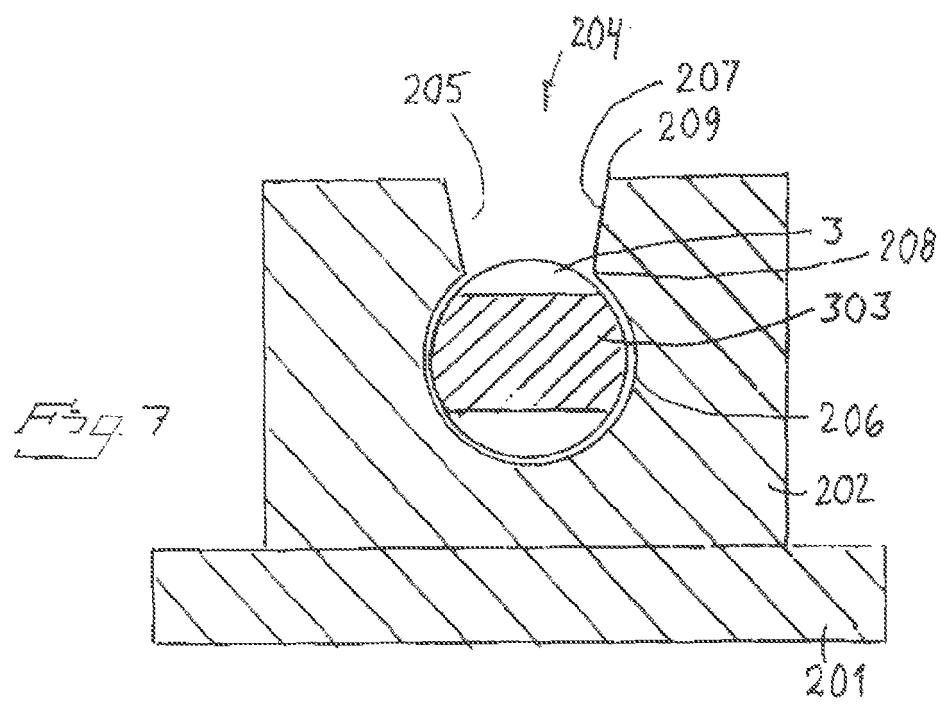
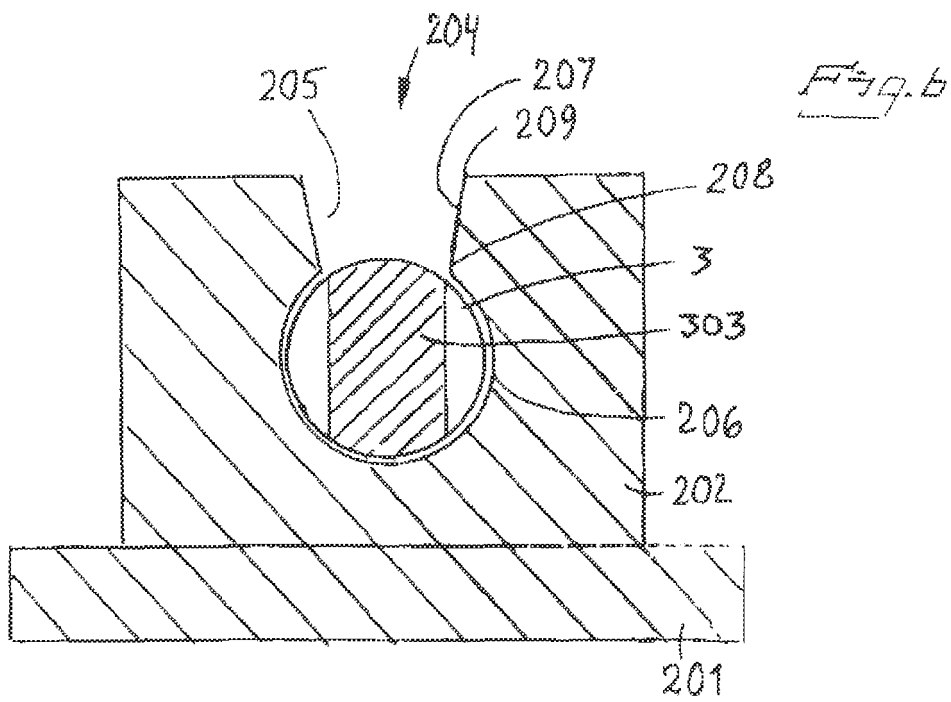
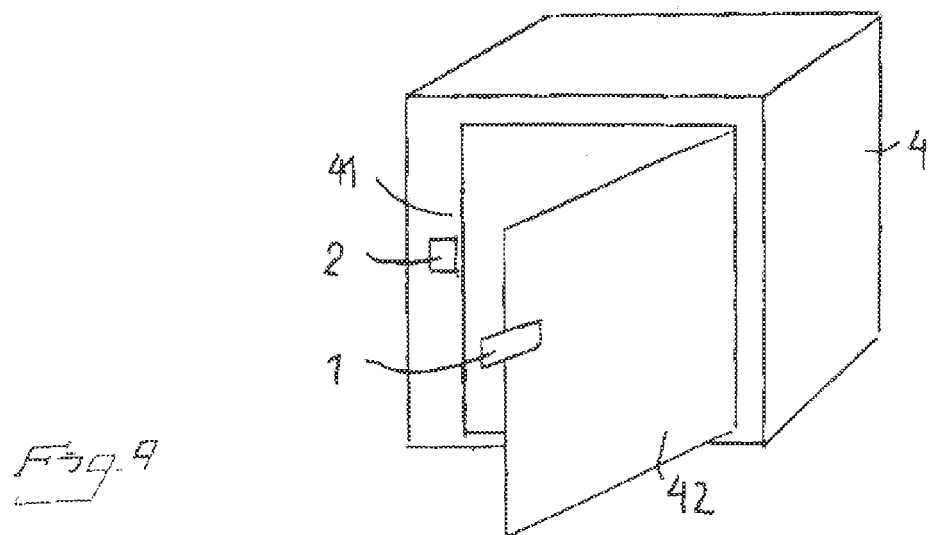
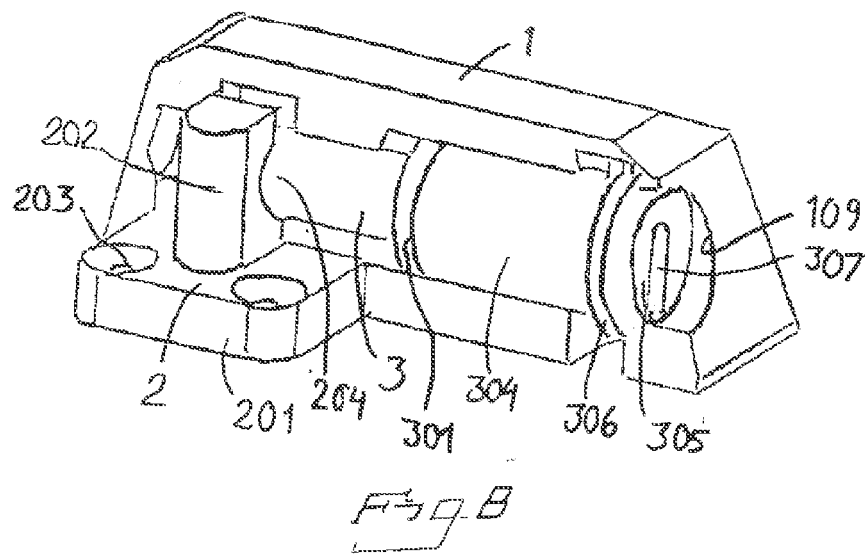


Fig. 3









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