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(54) Lock with hook-bolt

(57) A lock (1) comprising a hook bolt (8) which is mounted in the lock, pivotally movable between a retracted position and an extended position, a forend (18) exhibiting a bolt opening (34), through which the hook bolt (8) extends in the extended position. The lock further comprising a lock mechanism (6), which is connected to the hook bolt (8) for driving the hook bolt between the retracted and the extended position, whereby the bolt opening (34) and a cross section of the bolt (8), which cross section, in the extended position is arranged in the plane of the bolt opening (34), have similar elongated shapes having a longitudinal direction, each of which shapes is symmetrical and substantially convex at least in a direction perpendicular to the longitudinal direction, such that a width (W), measured perpendicular to the longitudinal direction of the elongated shapes, varies along a length (L) of each of said shapes. The elongated shapes comprise two mutually opposed short sides (52) and two mutually opposed long sides (54), wherein the width of the elongated shapes between the long sides is maximal in an intermediate region of the shapes between the short sides.

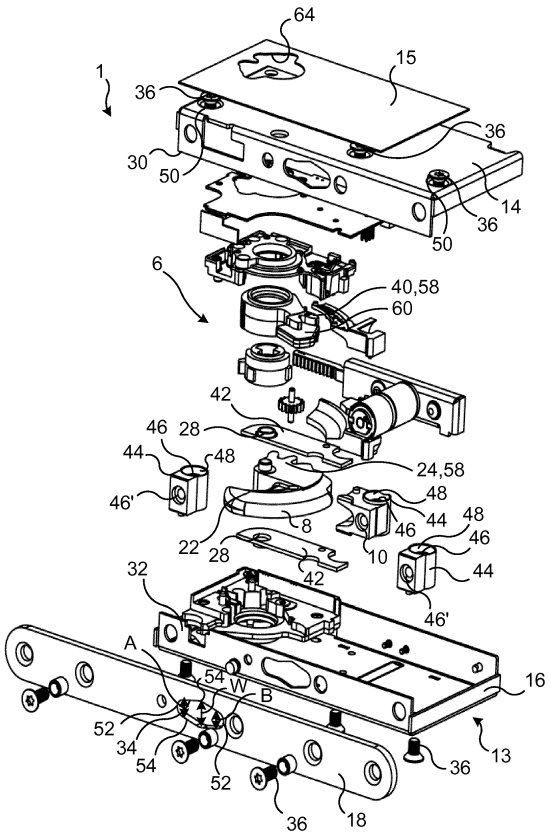


Fig. 1

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Description

TECHNICAL FIELD

[0001] The invention relates to a lock of the hook-bolt type in which the latch or look bolt has a hook-shape and engages as such in a striker plate. The lock according to the invention can be used in various types of locks such as espagnolettes or other types of multi point or single point locks. Due to the strong and stable nature of the lock it may be possible to use the lock in a single lock system.

BACKGROUND

[0002] Locks of the described type are used in outer doors, security doors, balcony doors and windows. Such locks typically comprise a lock housing or lock case in which at least one follower, for example a handle or key follower, is arranged. The handle or key follower is coupled to one or more lock bolts via a follower interface and a complementary follower interface. The lock bolt can be moved by the follower from an unlocked position into a locked position and back via the handle or key follower. In the locked position the lock bolt extends through or passes over a forend and is engaged in a striker plate in the doorframe. It is known to use hook-shaped bolts as lock-, latch-or dead bolts and to arrange a passage in the forend, which allows the lock bolt to extend through the forend in the locked position. When the hook-bolt is moved from the unlocked into the locked position it is pivoted so that the free end of the hook can engage deeply in the striker plate.

[0003] When a door or window comprising a conventional lock is forced open or when it is at least tried, for example by using a crowbar, a lot of forces act on the lock and the door or window and the striker plate, respectively. The lock bolt usually absorbs a lot of forces, especially shear forces, which are transferred to the lock case, the forend and the striker plate. The transferred forces may result in deformations of the striker plate, the lock case or the forend. The lock bolt is usually strong enough to withstand the forces. In the forend the forces result in compressive-, shear- and tensile stress within the material. Forces, in particular shear-forces, within a flat element comprising an opening or a passage with corners, such as the forend, create stress-peaks in areas with the lowest material thickness, thus normally around the corners of the opening or passage, especially when this corners are sharp. Experience has shown that the forend most likely will fail in a region of the corners of the bolt opening. As soon as the forend breaks or partially breaks a burglar has an easier job (deformation) to open the door and to completely destroy the lock.

[0004] EP o 634 552 A1 discloses a lock comprising a hook bolt and a forend with a rectangular bolt opening, configured to let the hook bolt extend through in a locked position.

[0005] Further, in conventional locks, the lock casing is usually composed by countersunk bolts whereby the material of the lock casing is weakened around the screw apertures of the lock case. Typically the screw apertures are turned, drilled or milled, which means material is locally removed to achieve a conical shape around the screw apertures so that the countersunk bolts can be fully inserted and screwed in. This may result in local weak points around the screw apertures.

SUMMARY

[0006] It is an object of the present invention to provide an improved lock case and an improved lock that is strong and secure.

[0007] Another object is to provide a lock of this kind that is difficult to manipulate and destroy.

[0008] Another object is to provide a lock of this kind that is at least partially modular in its build up and that allows a modular production set up.

[0009] Another object is to provide a lock of this kind, which requires considerable efforts to be destroyed or opened.

[0010] A further object is to provide a lock of this kind, which has a reduced amount of points of failure.

[0011] One more object is to provide a lock that is economic in which the best possible stability is achieved by optimized material use.

[0012] These and other objects are achieved with a lock type which is defined in the introductory part of claim 1 and which has the special technical features defined in the characterizing part of the claim. The lock comprises a hook bolt, which is mounted in the lock, pivotally movable between a retracted position and an extended position, a forend exhibiting a bolt opening, through which the hook bolt extends in the extended position; and a lock mechanism, which is connected to the hook bolt for driving the hook bolt between the retracted and the extended position. The bolt opening and a cross section of the bolt, which cross section, in the extended position is arranged in the plane of the bolt opening, have similar elongated shapes. The shapes have a longitudinal direction, each of which shapes is symmetrical and substantially convex at least in a direction perpendicular to the longitudinal direction, such that a width as measured perpendicular to the longitudinal direction of the elongated shapes varies along a length of each of said shapes. The elongated shapes comprise two mutually opposed short sides and two mutually opposed long sides, whereby the width of the elongated shapes between the long sides is maximal in an intermediate region of the shapes between the short sides.

[0013] Such a design of the bolt opening and the hook bolt reduces shear forces in the forend around the bolt opening, especially in a region having low material thickness, which is in the present case in the intermediate region where the width of the shape and thus the bolt opening is maximal. The intermediate region may be lo-

cated in the middle of the bolt opening. However, it may possible to arrange the maximal width of the shapes slightly offset to the exact middle of the bolt opening and the shapes, respectively.

[0014] When a crowbar or the like is applied to the lock, thus the door or window, shear and tensile forces act upon the forend. Forces may for example act on the hook bolt in a direction perpendicular to a plane defined by the forend but also in a direction parallel to said plane. Such forces usually result in tensile, compressive and shear stresses within the forend. By choosing shapes as described above for the bolt opening and the hook bolt, respectively, only tensile stress but no shear stress will act upon regions in the forend with the lowest material thickness, when attempts to break the door open are made.

[0015] The long sides may be curves.

[0016] The short sides may be curves.

[0017] Rounded shapes reduce stress peaks within the material and within the forend, respectively.

[0018] Each of the long sides may comprise at least two straight lines.

[0019] This may facilitate the production of the hook bolt and the forend. The straight lines still allow to have a generally convex shape of the bolt opening and the cross section of the hook bolt.

[0020] The elongated shapes may be hexagons.

[0021] If the elongated shapes have a hexagonal shape, the hexagon may not be a regular hexagon but an elongated, convex hexagon. In an embodiment the elongated shapes may comprise curves and straight lines, whereby each straight line is connected to another straight line via at least one curve.

[0022] Such shapes further reduce stress or tension peaks.

[0023] In an embodiment the length of the bolt opening as measured in a longitudinal direction is approximately two to three times larger than the maximal width as measured in a direction perpendicular to the longitudinal direction.

[0024] The bolt opening and its shape, respectively have thus a long side, which is parallel with a longitudinal direction, usually a vertical direction.

[0025] The maximal width is preferably measured in a middle section of the bolt opening.

[0026] A minimal radius of the curves may be approximately 3.5mm.

[0027] A maximal radius of the curves may be approximately 10mm.

[0028] The curves may only comprise curves with a curvature higher than zero. Thus the short sides and the legs and the legs may not be interconnected by a straight line, which would be a curve having zero curvature.

[0029] The lock may comprise a guiding cam portion and a frame, whereby the hook bolt, the guiding cam portion and the frame together may form a bolt module configured to be used in various lock systems as a prefabricated module.

[0030] Such a module may be suitable for modularized production whereby various elements of the lock may be used in other lock types. This reduces the cost for the manufacturer and optimizes resources.

[0031] The hook bolt may comprise a pivot element, whereby the frame of the bolt module comprises two side plates having each complementary pivot elements configured to receive the pivot element of the hook bolt.

[0032] The pivot elements and complementary pivot elements securely connect the hook bolt to the frame and allow a pivoting of the hook bolt.

[0033] In a preferred embodiment the guiding cam portion may be in the form of a cradle, said cradle being configured to receive and guide the hook bolt from a retracted position to the extended position and back and wherein the guiding cam portion is integrally formed with a sleeve comprising a fastening portion. The cradle may as a main function guide the hook bolt but is also prevents and protects the lock case by more or less entirely seal or block the bolt opening when the hook bolt is in the extended position.

[0034] The cradle contacts the first and second side cover and increases the rigidity of the lock and the lock case, respectively.

[0035] Due to the rounded edges of bolt opening and the rounded shapes of the hook bolt and the guiding cam portion, the movement from the retracted position to the extended position and back is smooth and does not require a lot of effort. The cradle of the guiding cam additionally also provides sideways stability to the hook bolt.

[0036] In another embodiment the lock may comprise a first side cover with screw apertures, a second side cover with screw apertures and at least two fixing sleeves configured to interconnect the first and second side cover via screws received in the sleeve, wherein the at least two fixing sleeves have conical entry portions and wherein the material of the first and second side covers around the screw apertures is bent towards the conical entry portions so that countersunk bolts can engage the bent material and the conical entry portions.

[0037] The material around the screw apertures is not turned off but instead bent inwards without giving away material thickness around the screw apertures. This further reduces the week spots around the screw apertures of the lock and potentially the forend.

[0038] The bolt opening and its shape, may be defined by the following proportions or measurements; a first width measured in a first end section of the bolt opening and a second width measured in a second end section of the bolt opening are smaller than a third width measured in a middle section of the bolt opening and wherein the first, second and third width are measured in a direction perpendicular to a longitudinal direction of the bolt opening.

[0039] The bolt opening and thus its shape and the shape of the cross section of the hook bolt are bulging out in an intermediate region.

[0040] In a further embodiment the shape of the bolt

opening may not comprise any sharp corners.

[0041] The shape may be round and smooth without irregularities.

[0042] The hook bolt may be shaped as a beak with a protruding beak forefront.

[0043] Such a shape may increase the strength and resistance of the hook bolt.

[0044] In a preferred embodiment the hook bolt may be configured to be embedded in the lock with a slight play.

[0045] This may ensure a smooth operation of the hook bolt and thus the lock mechanism.

[0046] In an embodiment the lock case may comprise a first and second opening, whereby a first play between the bolt opening and the hook bolt, in the extended position, is the same as a second play between the first and second openings and the hook bolt, which is again the same as a third play between the hook bolt and the frame, which is once again the same as a fourth play between the guiding cam portion and the hook bolt.

[0047] Having the same play between various parts of the lock case and the hook bolt ensures that forces are distributed more equally, for example in case a burglar tries to brake the lock, and evenly and that the lock case is very firm and stable.

[0048] The hook bolt may comprise a complementary follower interface and the lock mechanism may comprise a follower interface and a guide plate fixedly connected with the follower interface, said complementary follower interface and follower interface together with said guide plate may be configured to engage in each other to drive the hook bolt from a retracted position into an extended position and back.

[0049] In another embodiment the complementary follower interface may comprise at least two parallel sprocket sectors with a gap in between and the guide plate may be configured to enter said gap.

[0050] The guide plate may provide additional stability and resistance for the interaction between follower interface and complementary follower interface. The follower interface of the lock mechanism may also comprise two parallel sprocket sectors configured to engage the parallel sprocket sectors of the complementary follower interface. Each of the two parallel sprocket sectors is fixedly connected to and arranged on opposite sides of the guide plate.

[0051] The guide plate provides additional side stability between the complementary follower interface and the follower interface.

[0052] Further objects and advantages of the invention emerge from the following detailed description and from the claims.

[0053] Generally, all terms used in the claims are to be interpreted according to their ordinary meaning in the technical field, unless explicitly defined otherwise herein. All references to "a/an/the element, device, module, side, etc." are to be interpreted openly as referring to at least one instance of the element, device, module, side, etc., unless explicitly stated otherwise.

BRIEF DESCRIPTION OF THE DRAWINGS

[0054] The invention is now described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 schematically illustrates an exploded perspective view of a lock according to the invention;

Fig. 2 schematically illustrates a side view of the lock with partially broken away parts with a hook bolt in the extended position;

Fig. 3 schematically illustrates a side view of the lock of figure 2 with the hook bolt in the retracted position;

Fig. 4a schematically illustrates a side view of the lock with the hook bolt in the extracted position;

Fig. 4b schematically illustrates a view on a cross section cut along line IVb-IVb of figure 4a;

Fig. 5a schematically illustrates a similar side view as figure 4a;

Fig. 5b schematically illustrates a view on a cross section cut along line Vb-Vb of the lock of figure 5a;

Fig. 5c schematically illustrates a view on a cross section cut along line Vc-Vc of the lock of figure 5a;

Fig. 5d schematically illustrates a view on a cross section cut along line Vd-Vd of the lock of figure 5a;

Fig. 6 schematically shows a perspective view of a bolt module; and

Figs. 7 to 9 illustrate possible shapes for the bolt opening and thus for the hook bolt.

DETAILED DESCRIPTION

[0055] The invention will now be described more fully hereinafter with reference to the accompanying drawings, in which certain embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided by way of example so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout the description.

[0056] Referring now to the figures, which shown an exemplary embodiment of the invention, a lock 1 comprises a lock case 13, a bolt module 2 and a lock mech-

anism 6.

[0057] The bolt module 2, as best illustrated in figure 6, comprises a hook bolt 8, a guiding cam portion 10 and a frame 12. The hook bolt 8 is rotatably embedded in the frame 12. The guiding cam portion 10 is fixedly connected to the frame 12 so that the guiding cam portion 10 may guide the hook bolt 8 during a pivoting movement from a retracted position to an extended position and back, as for example illustrated in figures 2 and 3. The guiding cam portion 10 is configured to engage a lower periphery of the hook bolt 8, said periphery extending more or less over the entire length of the hook bolt 8. The guiding cam portion 10 is configured to support the hook bolt 8 and to spread and distribute side and shear forces, when the hook bolt 8 is in the extended position and when somebody tries to break the lock. The guiding cam portion 10 is shaped as a cradle in which the hook bolt 8 may engage. The frame 12 is configured to hold the hook bolt 8 and the guiding cam portion 10 in position. The bolt module 2 is configured to form a unit which in itself is a complete assembly unit designed to be used in various lock types, wherever suitable. The bolt module 2 is herein illustrated by means of a single bolt lock, it may however be used in various locks. It is possible to use two or more bolt modules 2 per lock. Further, the bolt module 2 is to be understood as a modular part that forms part of a modular production system.

[0058] The hook bolt 8 is shaped as a hook or more in detail as a beak and it comprises a protruding beak forefront 26 and rounded edges 22. The hook bolt 8 is embedded in the frame 12 by means of a pivot element 38. It is possible and falls within the scope of the invention to make the hook bolt 8 out of one single piece of a material or to make it out of several pieces, which may even comprise various materials.

[0059] The hook bolt 8 further comprises a complementary follower interface 24 which may be in the form of a sprocket sector, as best illustrated in figures 1 to 3 and 6. The hook bolt 8 does not comprise any sharp edges, at least not in a region that is configured to engage in a striker plate of a door frame (not shown). The hook bolt 8 comprises a specially shaped cross section along its periphery that is configured to engage the guiding cam portion 10.

[0060] Figure 4b shows a view on a cross section on a cut along line IVb-IVb of figure 4a. It can be seen that the hook bolt 8 has a kind of an oval cross sectional shape, as seen in a top down view on a cross section of the hook bolt 8. Such a shape prevents the entering of a break-in tool into the bolt opening 34 of the forend 18 and thus into the lock case 13. Other shapes of the hook bolt 8 may have the same effect.

[0061] The guiding cam portion 10 comprises at least one fixing sleeve 44 with a fastening portion 46, which may be a thread portion, as illustrated in figure 1. The fixing sleeve 44 is configured to have a conical entry part so that a countersunk bolt 36 may smoothly engage the fixing portion in the fixing sleeve 44.

[0062] The frame 12 comprises the complementary pivot element 28 and side plates 42, as best illustrated in figures 1 and 6. The complementary pivot element 28 is configured to engage the pivot element 38 of the hook bolt 8. The complementary pivot element 28 and pivot element 38 may for example be a bolt/hole combination as best shown in figure 1. The complementary pivot element 28 and pivot element 38 and the frame 12, respectively, are configured to embed the hook bolt 8 with a slight, defined play. Such a play may ensure a smooth operation of the hook bolt 8. The frame 12 comprises preferably two side plates 42, which may comprise the complementary pivot elements 28, the side plates 42 being configured to engage the hook bolt 8 via the pivot elements 38. The two side plates 42 are further configured to engage the guiding cam portion 10, which may form an integral unit together with the fixing sleeve 44. The side plates 42 may be glued, force fitted, clamped or in any other suitable way connected to the hook bolt 8 and the integral unit formed by the guiding cam portion 10 and the fixing sleeve 44.

[0063] The lock case 13 comprises a first side cover 14 with a first front side 30, a second side cover 16 with a second front side 32 and a forend 18. The first and second side covers 14, 16 each comprise screw apertures 50 and countersunk bolts 36 configured to extend through the screw apertures 50, as best illustrated in figure 1. The first side cover 14 and the second side cover 16 are connected via the countersunk bolts 36 and a plurality of fixing sleeves 44, as previously described. The screw apertures 50 comprise a conical entry portion, similar to the conical entry portion 48 of the fixing sleeves 44, with the difference that around the apertures 50 no material was removed. The material, in the illustrated case the material of the first and second side covers 14, 16, is bent, pressed or stamped so that no local weak point (removed material) is created. Such a pressing may be achievable via pressing or stamping machines. The conical entry portion of the apertures 50 may be congruent with the conical entry portions 48 of the fixing sleeves 44 so that the countersunk bolts 36 may completely sink into the first - and second side cover 14, 16, respectively. On the first and/or the second side cover 14, 16 a cover portion 15 may be arranged, which covers most of the lock case 13. As best shown in figure 4a, the cover portion 15 may comprise a passage 64 configured to provide access to the lock 1 for a key follower, a follower handle or the like (not shown).

[0064] The engagement of the fixing sleeves 44 and the countersunk bolts 36 is also illustrated in figure 5d. Each fixing sleeve 44 is configured to receive two countersunk bolts 36.

[0065] The fixing sleeves 44 are further configured to comprise fastening portions 46' that are oriented perpendicular to fastening portions 46 that are configured to connect the first and second side covers 14, 16. The perpendicular oriented fastening portions 46' are configured to connect the forend 18 to the lock case 13, as shown

in figure 1.

[0066] The first and second front sides 30, 32 may be arranged so that they are parallel to and facing the forend 18, as illustrated in figure 1. The first and second front sides 30, 32 both comprise openings that are configured to let the hook bolt 8 pass through in the extended position. The openings of the first and second front sides 30, 32 may have a shape that is different from the hook bolt 8, as illustrated in the figures, for example in figure 1. The forend 18 comprises a bolt opening 34. The bolt opening 34 does not necessarily need to have the same shape as the first and second openings in the first and second front side 30, 32 of the side covers 14, 16, as illustrated in figures 5b and 5c. The first and second front sides 30, 32 of the lock case 13 may provide additional stability to the lock 1.

[0067] As figures 1 and 5a to 5d best illustrate, the bolt opening 34 is configured to let the hook bolt 8 extend through in the extended position and to retract from the extended position into the retracted position. The bolt opening 34 and the cross section of the bolt 8 have corresponding shapes. In the extended position the cross section is arranged in the plane of the bolt opening 34. The two corresponding shapes or circumferences comprise two mutually opposed short sides 52 and two mutually opposed long sides 54. Each long side 54 comprises two straight lines or legs 56 extending towards each other and diverging from the two straight lines or legs 56 of the corresponding straight lines or legs 56 of the opposite long side 54 towards a intermediate region of the bolt opening 34. The intermediate region of the bolt opening 34 comprises a width (W), which is basically the greatest width (W) the bolt opening 34 comprises, as measured in a direction perpendicular to a longitudinal direction. The two legs 56 of a corresponding long side 54 extend between a respective end of each short side 52, whereby the legs and the short sides are interconnected by curves or radii. The short sides 52 may preferably constitute a radius or they may at least be curved, as best illustrated in figures 1 and 5b to 5d. The shape or circumference of the bolt opening 34 is smooth and regular. It does not comprise any sharp edges or corners. The short sides 52 are connected to the long sides 54 in a tangential manner, which means that any radii or curve smoothly overflows into a straight line of the short sides 52 and the legs 56, respectively and vice versa. Thus the curves between the short sides 52 and the legs 56 and the curves between the two legs 56 of the long side 54 are tangentially connected to the shorts sides 52 and the legs 56, respectively.

[0068] In the illustrated embodiment the bolt opening 34 has a somewhat rounded rhomboid shape. The bolt opening 34 may further be or alternatively be described via width proportions, whereby a first width A as measured in a first end section of the bolt opening 34 and a second width B as measured in a second end section of the bolt opening 34 are smaller than the third width W. The first, second and third width A, B, W may preferably be measured in a direction perpendicular to the longitudinal or vertical (lock installed) direction, as illustrated in figures 1 and 5b.

[0069] Figs 7 to 9 illustrate, schematically further possible geometrical shapes of bolt opening 34 that may fulfil the above objects. All shapes have the maximal width W in the intermediate region and lower widths A, B in an end region (fig. 7) or at the ends (figs. 8 and 9). Further, in figure 7, the length L of the bolt opening 34 is illustrated, which length L may be easily determined for the shapes illustrated in figures 8 and 9 as well. The length L is measured in a longitudinal direction of the bolt opening 34. The shapes shown in these figures 7 to 9 may lead to an accordingly adapted shape of the hook bolt 8 and its cross sections, respectively. Since the maximal width W of the bolt opening 34 is in an intermediate region of the bolt opening 34, the forend 18 has the lowest material thickness in a region that corresponds to the intermediate region. The shown shapes of the bolt openings 34 in figures 7 to 9 lead to a stress distribution within the forend 18 that mainly or only has tensile stresses in the regions with the lowest material width, when forces are applied to the lock. Shear stress combined with tensile- or compressive stress will be absorbed at other positions within the forend 18.

[0070] Figure 7 illustrates an elliptic shape of the bolt opening 34. Such an elliptic shape may lead to a hook bolt 8 that has elliptic cross sections.

[0071] Figure 8 illustrates also an elliptic shape of the bolt opening 34 but with cut ends on both sides.

[0072] Figure 9 illustrates a hexagonal shaped bolt opening 34, the hexagonal shape being non-regular, which means that not all sides comprise the same length.

[0073] The two straight lines or legs 56 of the long sides 54 may be longer than the straight line or leg of each short side 52.

[0074] As previously mentioned, the form or shape of the hook bolt 8 may be adapted to the shape of the bolt opening 34.

[0075] The bolt opening 34 has now been described as by means of a few specific shapes" it may however be possible that the bolt opening 34 and consequently the hook bolt 8 have other shapes or circumferences that fulfils the requirement of reducing tension peaks. Such a shape may be any rounded shape that fits onto a forend 18 of a lock 1. The scope of the invention is thus not limited to the specific shape of the bolt opening 34 as described.

[0076] The locking mechanism 6 comprises a follower 20, follower interface 40 and a guide plate 60. The follower interface 40 is configured to engage in the complementary follower interface 24 of the hook bolt 8. The complementary follower interface 24 and the follower interface 40 may each comprise a set of two parallel sprocket sectors 58 which are spaced apart. The sprocket sectors 58 of the follower interface 40 are spaced apart by the guide plate 60, as best illustrated in figure 1, 4b and 5d. Also the two sprocket sectors 58 of the comple-

mentary follower interface 24 may be spaced apart but by a gap 62, said gap 62 being configured to receive the guide plate 60, as best illustrated in figures 1, 4b and 5d. Such an engagement between the gap 62 and the guide plate 60 provides additional sideways-stability to the look mechanism 6.

[0077] It is within the scope of the invention that the complementary follower interface and the follower interface may comprise a plurality of parallel sprocket sectors and that the invention is not limited to two parallel sprocket sectors.

[0078] The invention has mainly been described above with reference to a few embodiments. However, as is readily appreciated by a person skilled in the art, other embodiments than the ones disclosed above are equally possible within the scope of the invention, as defined by the appended patent claims.

Claims

1. A lock (1) comprising:

- a hook bolt (8) which is mounted in the lock, pivotally movable between a retracted position and an extended position;
- a forend (18) exhibiting a bolt opening (34), through which the hook bolt (8) extends in the extended position; and
- a lock mechanism (6), which is connected to the hook bolt (8) for driving the hook bolt between the retracted and the extended position,

characterized in that

the bolt opening (34) and a cross section of the bolt (8), which cross section, in the extended position is arranged in the plane of the bolt opening (34), have similar elongated shapes having a longitudinal direction, each of which shapes is symmetrical and substantially convex at least in a direction perpendicular to the longitudinal direction , such that a width (W), measured perpendicular to the longitudinal direction of the elongated shapes, varies along a length of each of said shapes, the elongated shapes comprising two mutually opposed short sides (52) and two mutually opposed long sides (54), wherein the width of the elongated shapes between the long sides is maximal in an intermediate region of the shapes between the short sides.

2. Lock according to claim 1, wherein the long sides (54) are curves.

3. Lock according to claim 1 or 2, wherein the short sides (52) are curves.

4. Look according to claim 1 or 3, wherein each of the long sides (54) comprises at least two straight lines.

5. Lock according to claim 1, wherein the corresponding elongated shapes are hexagons.

6. Lock according to any of the previous claims, wherein the elongated shapes comprise curves and straight lines and wherein each straight line is connected to another straight line via at least one curve.

7. Lock according to claim 1, wherein the length of the bolt opening as measured in a longitudinal direction is approximately two to three times larger than the maximal width (W) as measured in a direction perpendicular to the longitudinal direction.

8. Lock according to claim 2 or 3, wherein a minimal radius of the curves is greater or equal to 3.5 mm.

9. Lock according to claim 2 or 3, wherein a maximal radius of the curves is smaller or equal to 10 mm.

10. Lock according to any of the previous claims, comprising a guiding cam portion (10) and a frame (12), wherein the hook bolt (8), the guiding cam portion (10) and the frame (12) together form a bolt module (2) configured to be used in various lock systems as a prefabricated module.

11. Lock according to any of the previous claims, the hook bolt (8) comprising a pivot element (38), wherein the frame (12) of the bolt module (2) comprises two side plates (42) each having complementary pivot elements (28) configured to receive the pivot element (38) of the hook bolt (8).

12. Lock according to claim 10 or 11, wherein the guiding cam portion (10) is in the form of a cradle, said cradle being configured to receive and guide the hook bolt (8) from a retracted position to the extended position and back and wherein the guiding cam portion is integrally formed with a sleeve (44) comprising a fastening portion (46).

13. Lock according to any of the previous claims, comprising a first side cover (14) with screw apertures (50), a second side cover (16) with screw apertures (50) and at least two fixing sleeves (44) configured to interconnect the first and second side cover via screws, wherein the at least two fixing sleeves (44) have conical entry portions (48) and wherein the material of the first and second side covers (14, 16) around the screw apertures (50) is bent towards the conical entry portions (48) so that countersunk bolts can engage the bent material and the conical entry portions (48).

14. Lock according to any of the previous claims, wherein the hook bolt (8) is shaped as a beak with a protruding beak forefront (26).

15. Lock according to any of the previous claims 10 to 15 wherein the lock case (13) comprises a first and second opening and wherein a first play between the bolt opening (34) and the hook bolt (8), in the extended position, is the same as a second play between the first and second openings and the hook bolt (8), which is again the same as a third play between the hook bolt (8) and the frame (12), which is once again the same as a fourth play between the guiding cam portion (10) and the hook bolt (8).

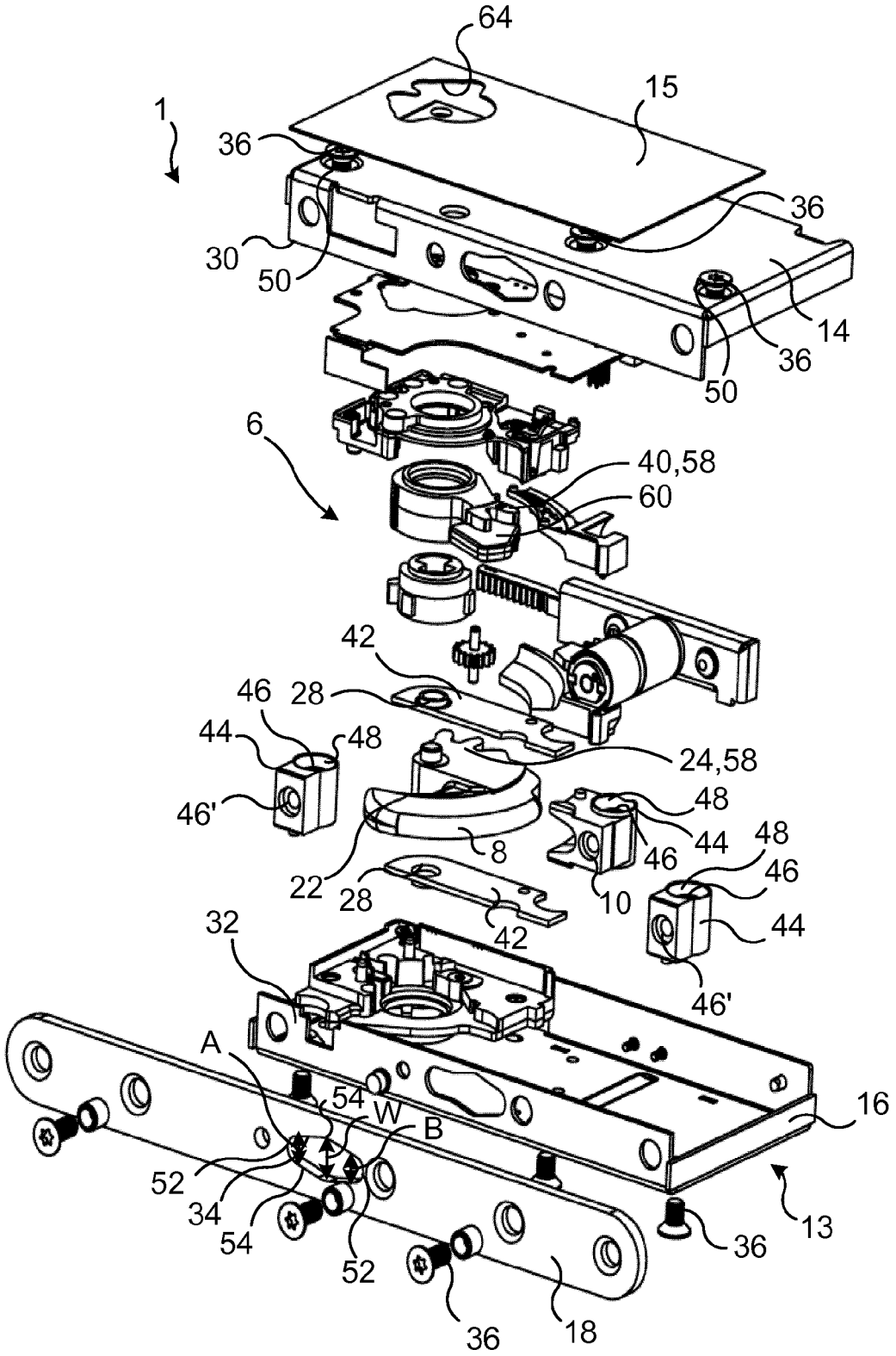

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Fig. 1

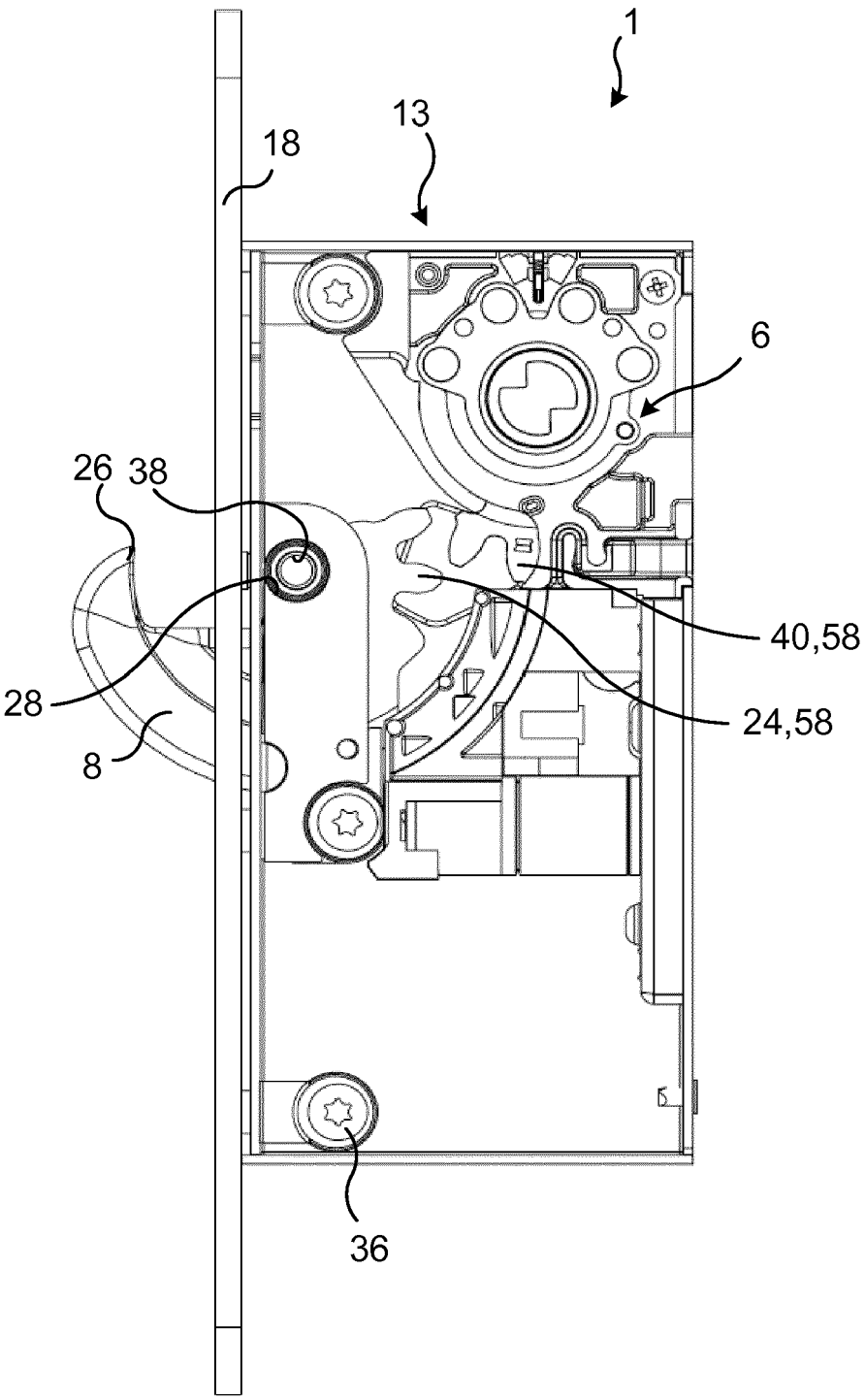


Fig. 2

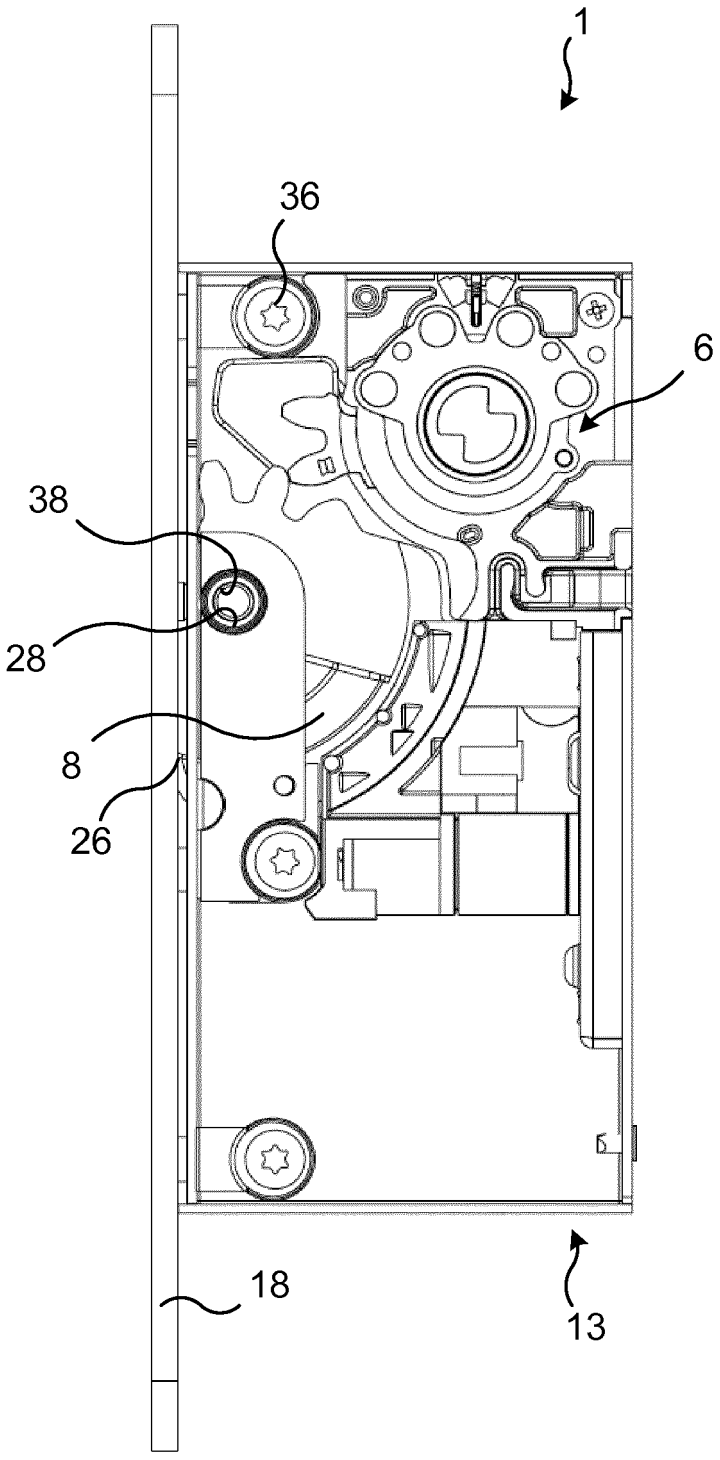


Fig. 3

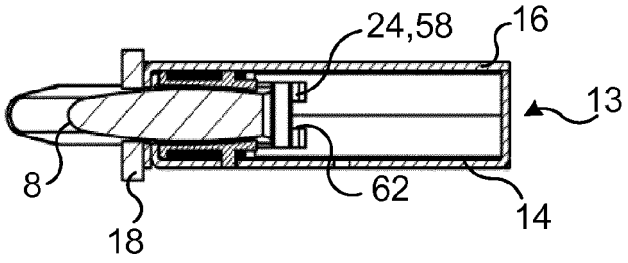


Fig. 4b

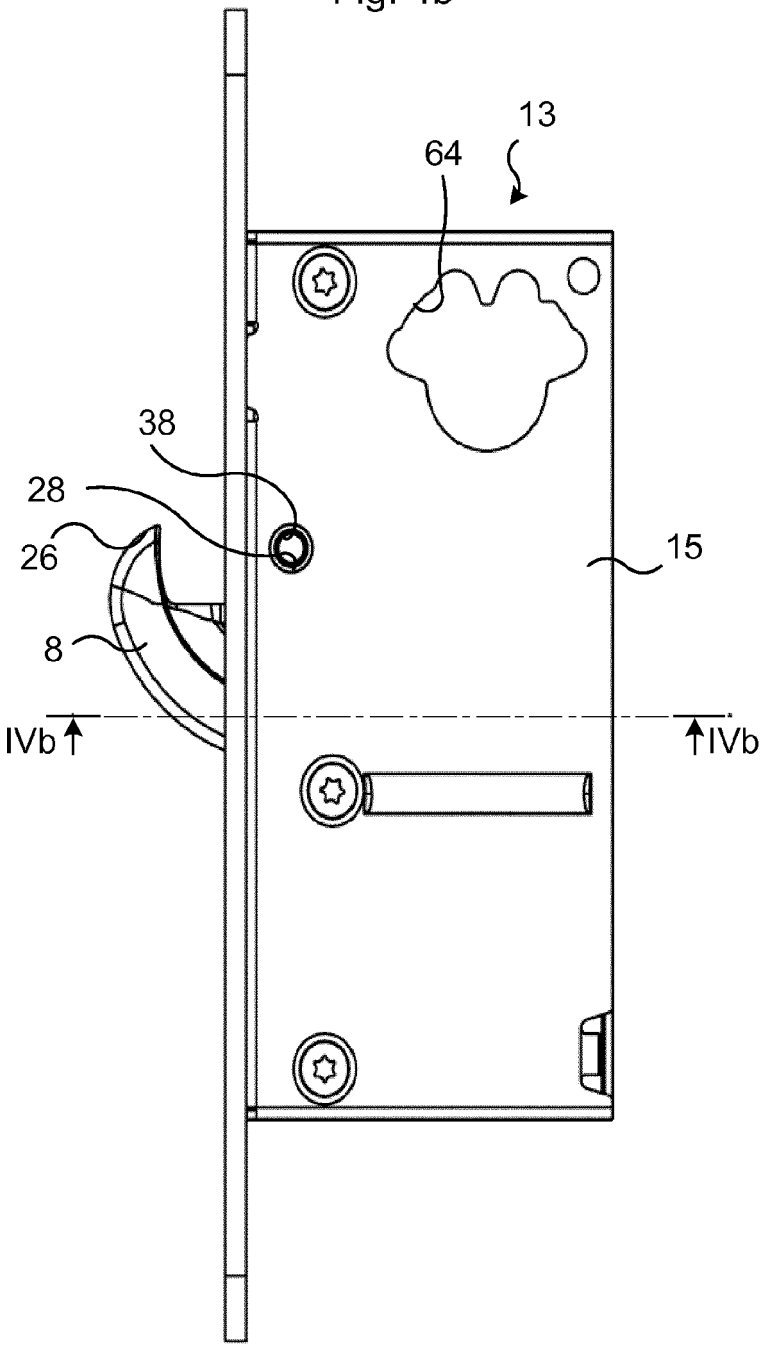


Fig. 4a

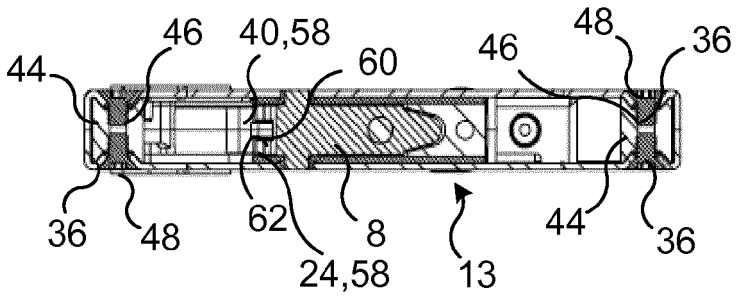


Fig. 5d

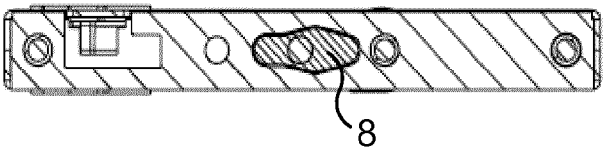


Fig. 5c

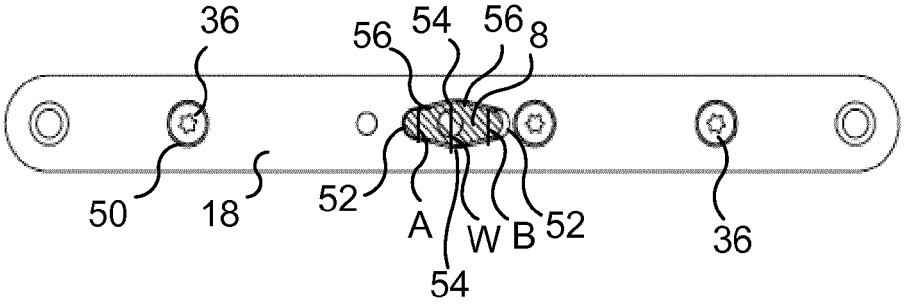


Fig. 5b

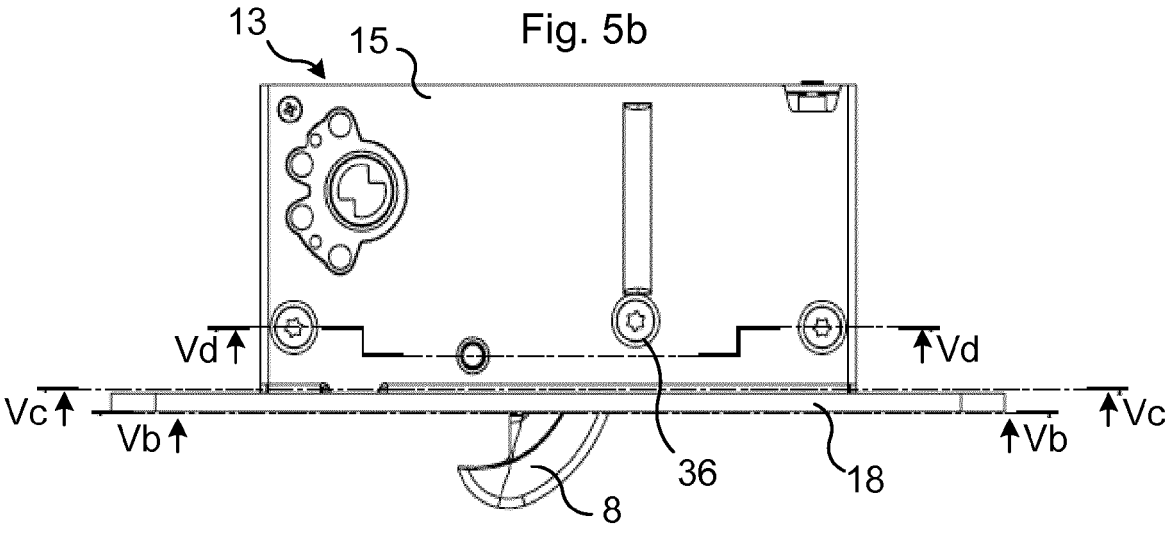


Fig. 5a

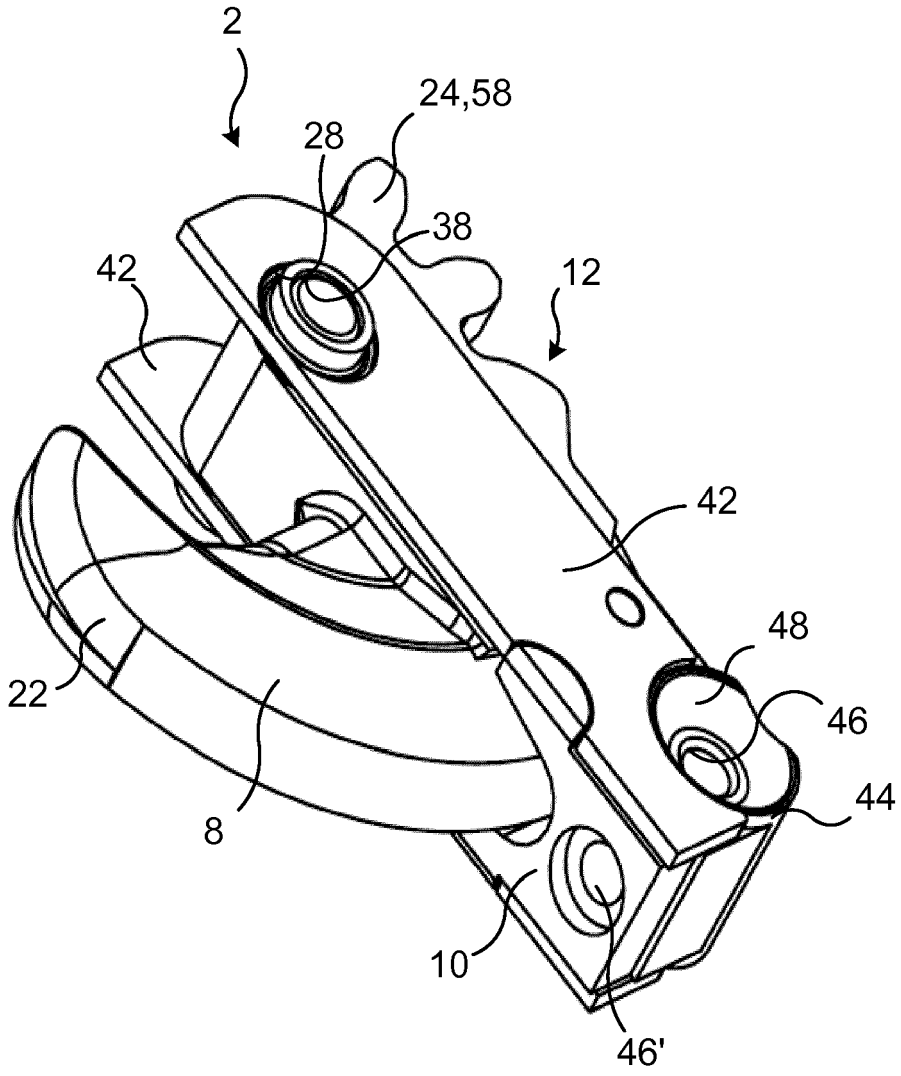


Fig. 6

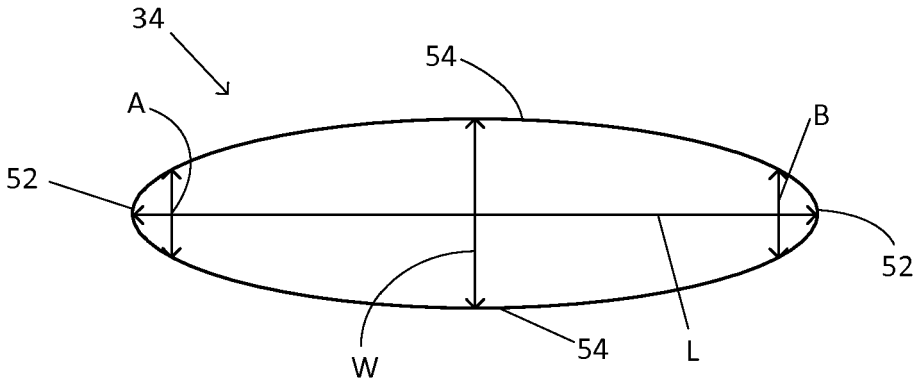


Fig. 7

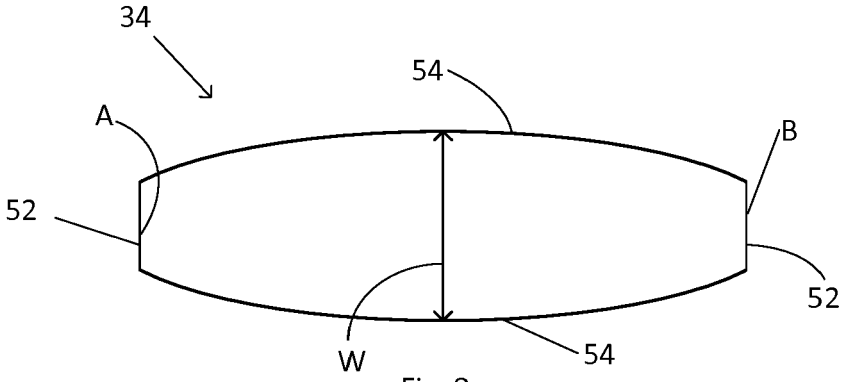


Fig. 8

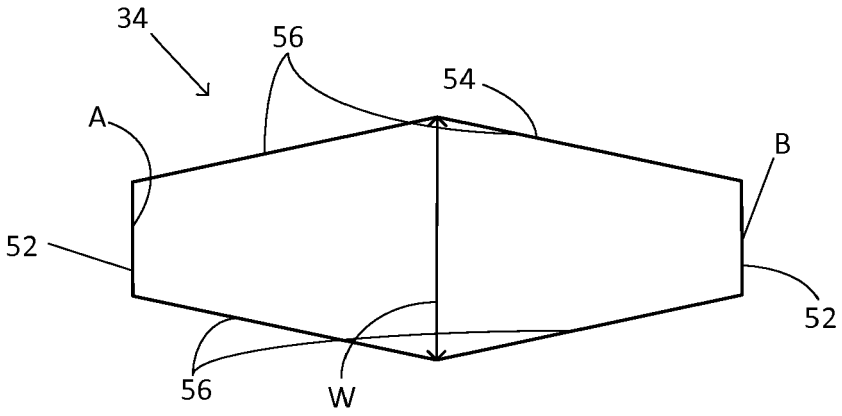


Fig. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 13 19 2647

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 2 496 992 A (ASSA ABLOY LTD [GB]) 29 May 2013 (2013-05-29) * page 28, line 3 - page 29, line 17; figures 4d5a-5g *	1-15	INV. E05B63/00 E05B65/08 E05C9/18 E05B15/10
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E05B
E05C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	17 July 2014	Geerts, Arnold

CATEGORY OF CITED DOCUMENTS

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