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(54) **BOLT SUPPORT PLATE AND LOCK MECHANISM**

(57) A bolt support plate for fitting to a door or gate and connectable with a lock having a lock body on an opposing surface of the door or gate, comprises one or more holes, wherein the edges of the holes provide a bolt, e.g. a latch bolt or a dead bolt of the lock, with a close fit, thereby providing lateral support for the bolt. A kit comprises the support plate and a corresponding lock.

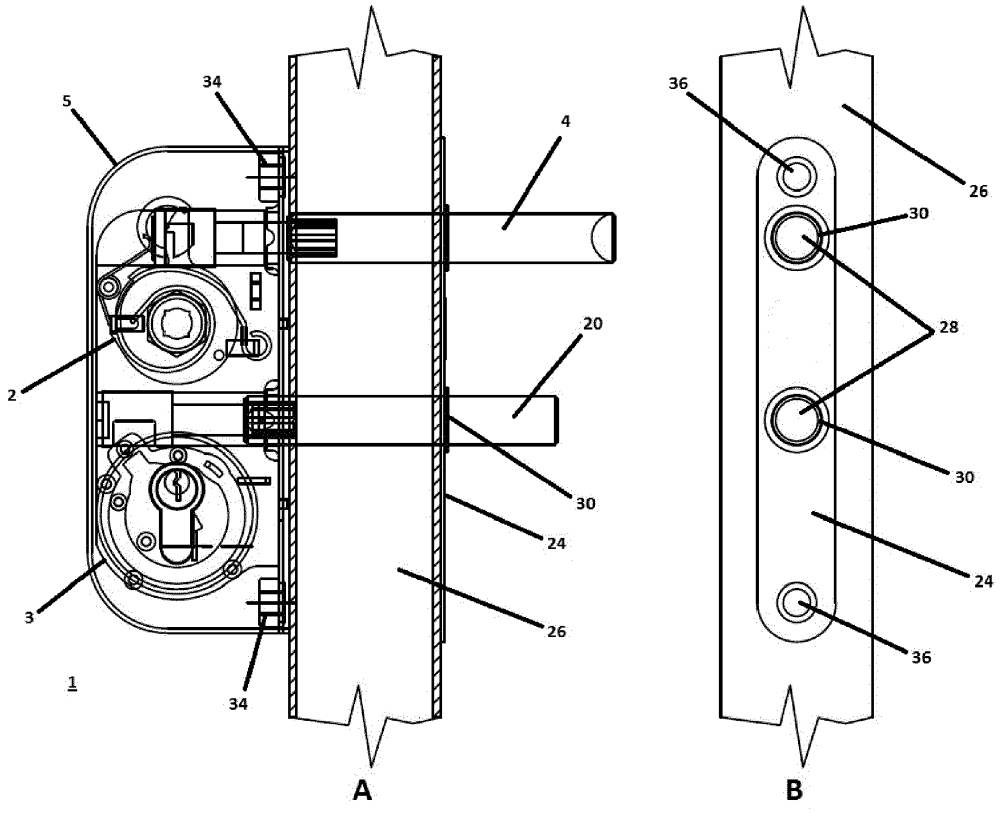


Fig. 1

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Description

Introduction

[0001] The present invention relates to a bolt support plate for use in a lock for a gate or door and a dead bolt mechanism for use therewith.

Background to the Invention

[0002] Various types of lock mechanism are known in the art. Latch bolt locks use a spring to hold the bolt in place, allowing retraction by applying force to the bolt itself, whereas dead bolts are thrown by a mechanism that requires rotation of a key in a lock mechanism in order to move between retracted and projecting positions.

[0003] Dead bolt locks and latch bolt locks are often used in combination to provide a mixture of convenience and security.

[0004] Dead bolt locking mechanisms are used to allow dead bolts to be locked in either their retracted or projecting positions. A known mechanism for locking dead bolts is spring-operated, which works by requiring a rotary driving bit to apply force against the action of a spring, in order to move the locking means into an unlocked position, wherein the dead bolt can be moved.

[0005] The lock described in EP2915939 contains one such mechanism and comprises a dead bolt slidably mounted, via a dead bolt lever, to allow horizontal movement between a projecting position and a retracted position. The dead bolt is locked in both positions by a locking means comprising a retaining plate which is slidably mounted to allow vertical movement. The retaining plate has a horizontal slot with an upwards notch at each end. The retaining plate rests in a downwards position so that horizontal sliding is prevented by a sliding means being positioned into one of the notches of the retaining plate and thus locking the dead bolt in either the projecting position or the retracted position. The movement of the dead bolt is controlled by rotating the key in the cylinder and thus by rotation of a rotary driving bit. Movement of the rotary driving bit results in engagement with the bottom edge of the retaining plate so that the retaining plate is lifted and the dead bolt is unlocked. Subsequent rotation of the key results in the driving bit pushing the pivotally mounted dead bolt lever (and hence dead bolt) horizontally between the projecting position and retracted position, until the sliding means aligns with a notch and the retaining plate falls back downwards and again locks movement of the dead bolt. Mechanically, the mechanism is therefore a complex one.

[0006] Single cam locking mechanisms are well-known in the art; see for example WO 2015/000876, GB2288207, GB1485267 and DE8311309. The lock mechanism of NL7807082 demonstrates the use of two cams to throw a deadbolt.

[0007] Many known locks use a common cylinder, the Euro cylinder, with a fixed size and fixed range of rotation, limiting the throw distance of the dead bolt.

[0008] Both dead bolt mechanisms and latch bolt mechanisms are inherently susceptible to damage caused by lateral impact of their respective bolts. This is often a problem when e.g. a dead bolt is inserted into an aperture in order to lock e.g. a door but that dead bolt is free to move laterally in the aperture. As a result, movement of the dead bolt in the aperture leads to lateral impacts that wear down the dead bolt mechanism.

[0009] It is clear from the prior art that there exists a need for improved and alternative dead bolt mechanisms that provide more throw for the dead bolt and/or are simpler in operation and hence to manufacture. Further still, there is a need for increased protection against damage suffered by dead / latch bolt mechanisms due to lateral impacts of their respective bolts.

[0010] An aim of the present invention is to provide alternative dead bolt mechanisms. An aim of certain embodiments of the invention is to provide such mechanisms that at least ameliorate one or more problems identified in the art. A further aim of preferred embodiments of the invention is to provide a dead bolt mechanism that throws a dead bolt further for a given driving bit movement and/or comprises an alternative or improved locking mechanism.

Summary of the Invention

[0011] According to a first aspect of the invention, a dead bolt mechanism is provided for a lock for a gate or a door, comprising a dead bolt which is thrown between retracted and projecting positions by a driving bit engaging and driving a cam that in turn engages and drives a cam follower connected to the dead bolt.

[0012] An advantage of having the driving bit move the cam, as opposed to the driving bit directly move the cam follower, and hence dead bolt, is that a multiplier effect results, i.e. movement of the cam while driving the cam follower can be greater than the movement of the driving bit while driving the cam. This means that the dead bolt can be thrown further. Using the known Euro cylinder, a standard throw distance is usually approximately 18mm. In a specific example of the invention illustrated below in more detail, the dead bolt was thrown approximately 30mm using that same cylinder. This is significant in the extent to which the thrown dead bolt can engage with its receiving aperture. Further increased throw is possible by modification of dimensions of the various components.

[0013] The driving bit and the cam are preferably both rotary. The rotational axis of the driving bit is preferably offset from the cam's rotational axis. In this way, a driving bit, with a given capacity for throwing a dead bolt, can be used to drive a cam with a greater capacity for throwing a dead bolt.

[0014] The mechanism typically comprises a cam body comprising a cam aperture, engaged and disengaged by the driving bit as it turns, and a cam which generally

projects from the body and drives the cam follower. The cam follower drives the dead bolt, e.g. by the cam follower being integral with or on or connected to the dead bolt. In typical operation, rotation of the outer point of the driving bit effectively describes a first circle and rotation of the innermost point of the cam aperture effectively describes a second circle with a greater diameter than the first and with a centre offset from the first. The circles intersect, thus the paths of the driving bit and cam aperture intersect, allowing the driving bit to engage and drive the cam aperture so as to move the cam (further outwardly spaced from the centre of rotation) a greater lateral distance than the lateral distance travelled by the driving bit during its engagement in the cam aperture. This effect is referred to as a multiplier effect above and below.

[0015] The invention thus provides a dead bolt mechanism, comprising a dead bolt which is thrown between retracted and projecting positions by a driving bit engaging and driving a cam that in turn engages and drives a cam follower on the dead bolt.

[0016] Preferably, lateral movement of the cam while driving the cam follower is greater than the lateral movement of the driving bit while driving the cam.

[0017] In effect, the driving bit constitutes a first, inner cam, the cam constitutes a second, outer cam and comprises a second cam follower. The first, inner cam thus engages the second cam follower and drives the second, outer cam which in turn engages and drives the dead bolt cam follower.

[0018] It is preferred that the driving bit and cam are rotary, and preferably the rotational axes thereof are offset from each other.

[0019] The driving bit preferably disengages the cam after the cam has moved the dead bolt into its retracted or projecting position. It can then be rotated to a position allowing removal of a key from a lock comprising the mechanism.

[0020] In a preferred embodiment of the invention, the dead bolt mechanism comprises a locking mechanism to lock the dead bolt when in the projecting position. It is preferred that the dead bolt is locked by jamming of a surface of the cam follower on a surface of the cam when the dead bolt is in the projecting position.

[0021] Furthermore, it is preferred that in the projecting position the cam is partially exited from the cam follower in a manner that causes the respective surfaces to jam when there is inwards force on the dead bolt.

[0022] The dead bolt mechanism may also comprise a locking mechanism to lock the dead bolt when in the retracted position. It is preferred that in the retracted position the dead bolt is locked by jamming of a surface of the cam follower on a surface of the cam. Additionally, it is preferred that in the retracted position the cam is partially exited from the cam follower in a manner that causes the respective surfaces to jam when there is outwards force on the dead bolt.

[0023] In preferred embodiments of the invention, movement of the cam is restricted to positions between the retracted (and locked) position and the projecting (and locked) position by one or more stops. The one or more stops are optionally widenings in the cam body that provide resistance against further cam body rotation once it reaches the retracted (and locked) position or the projecting (and locked) position.

[0024] In further preferred embodiments of the invention, the dead bolt mechanism is provided with one or more flip over springs (see e.g. Fig. 8) positioned so as to bias the cam into either the retracted (and locked) position or the projecting (and locked) position.

[0025] According to a second aspect of the invention, a dead bolt locking mechanism is provided comprising a dead bolt which is thrown between retracted and projecting positions by a cam that engages and drives a cam follower integral with or on or connected to the dead bolt, wherein in the projecting position the mechanism is locked by jamming of respective surfaces on the cam and cam follower.

[0026] It is preferred that in the projecting position the cam is partially exited from the cam follower causing the respective surfaces to jam when there is inwards force on the dead bolt.

[0027] Furthermore, the mechanism is optionally locked by jamming of respective surfaces on the cam and cam follower when in the retracted position. Preferably, in the retracted position the cam is partially exited from the cam follower causing the respective surfaces to jam when there is outwards force on the dead bolt.

[0028] It is preferred that movement of the cam is restricted to positions between the retracted (and locked) position and the projecting (and locked) position by one or more stops. The one or more stops are optionally provided as widenings in the cam body that provide resistance against further cam rotation once the cam reaches the retracted (and locked) position or the projecting (and locked) position. Preferably, the one or more stops prevent the cam from fully exiting the cam follower when the dead bolt is in the projecting position and/or retracted position.

[0029] The invention also provides a lock comprising the dead bolt mechanism described above and below and, optionally, a latch bolt mechanism. Further still, the invention provides gates / doors fitted with locks according to the invention.

[0030] Preferably, locks according to the invention further comprise a front support plate (otherwise known as a bolt support plate), wherein the front support plate comprises one or more holes, and wherein the edges of the one or more holes provide lateral support for the dead bolt and/or a latch bolt.

[0031] It is preferred that the front support plate is for attachment to a frame, especially an upright gate member such as a gate stile, on the opposing side from the dead bolt and/or latch bolt mechanisms. The bolt support plate preferably comprises one or more inserts (e.g. rings, especially brass rings) that at least partially cover

the edges of the one or more holes and act to provide the dead bolt and/or latch bolt with a close fit and a smooth and controlled motion through the one or more holes. In this context, a close fit is a clearance fit that allows unimpeded sliding of the bolt whilst having sufficiently small clearance for the edges of the plate holes to support the bolt against lateral movement.

[0032] In the context of the invention, and in gate, frame and panel construction, there are generally five basic members: the panel and the four members which make up the frame. The vertical members of the frame may be referred to as stiles and the horizontal members as rails. A basic frame and panel item has a top rail, a bottom rail, two stiles and a panel.

[0033] As mentioned above, it is preferred that the front support plate is suitable to be placed on the opposing side of the stile to the dead bolt and/or latch bolt mechanisms. The bolt (or bolts) passes (or pass) through the stile and then through the support plate on the opposing side (illustrated e.g. in Fig. 1A). The front support plate advantageously provides the bolts with lateral support and thus prevents damage to the bolt mechanisms resulting when lateral force is applied to the bolts. This is of particular importance in the case of the latch bolt, which is continuously exposed to lateral force upon opening and closing of the gate or door to which the lock is fitted. Additionally, the front support plate helps provide the bolt mechanisms with a smoother movement of the bolts.

[0034] Hence, in another aspect of the invention, there is provided a bolt support plate with one or more holes. Preferably, the bolt support plate of the invention is for fitting to a door or gate and is connectable with a lock having a lock body on an opposing surface of the door or gate (e.g. an opposing surface of a gate stile), wherein the bolt support plate comprises one or more holes, and wherein the edges of the holes provide a bolt, e.g. a latch bolt or a dead bolt of the lock, with a close fit, thereby providing lateral support for the bolt.

[0035] Optionally, the edges of the one or more holes in the bolt support plate comprise one or more inserts (e.g. brass rings) for providing a close fit between the bolt support plate and a bolt, so as to provide a smooth and controlled motion of the bolt through the one or more holes.

[0036] It is preferred that the bolt support plate comprises means for attaching the bolt support plate to a gate or door. Preferably, these means also attach the bolt support plate to a lock body on an opposing surface of the gate or door. Optionally, the means for attaching the bolt support plate comprise one or more holes for receiving screws, in which the screws act as fasteners with helical threads, passing through the gate or door and securing into a lock body.

[0037] Further still, there is provided a kit comprising the bolt support plate with a lock, e.g. a dead bolt lock. Together, the lock and bolt support plate can be fitted to e.g. gates and doors.

[0038] A kit of the invention may thus comprise a lock and a bolt support plate of the invention, wherein the lock comprises one or more bolts, being a latch bolt or a dead bolt or both a latch bolt and a dead bolt, and the edges of the one or more holes of the bolt support plate provide the one or more bolts with a close fit thereby providing lateral support to the one or more bolts when the lock and the bolt support plate are fitted to a door or gate.

[0039] The invention still further provides a stile of a gate or door, to which the kit is attached.

[0040] Preferably, the edges of the one or more holes in the bolt support plate provide the locking bolt(s) with a close fit and allow a smooth and controlled motion of the bolt(s) through the one or more holes. Preferably, the gap between the bolt and the inner surface of the hole in the bolt support plate is sufficiently small to allow a tight fit of the bolt. The motion is controlled in that sideways or lateral movement of the bolt is restricted and supported by the relatively small gap either side. Preferably, the gap between the bolt and the edge of the hole is no more than 1cm, preferably no more than 5mm, preferably no more than 4mm, preferably no more than 3mm, preferably no more than 2mm, and most preferably no more than 1 mm.

[0041] The 'close' fit of the bolt(s) in the hole(s) of the bolt support plate is sufficient to prevent significant lateral movement of the bolt(s). Thus, lateral support to the bolt(s) is achieved. Nevertheless, movement of the bolt(s) between the retracted and projecting positions is not inhibited by the close fit. The term 'close fit' is therefore equivalent to e.g. 'snug fit' and 'tight fit'.

[0042] Preferably, the bolt support plate comprises one or more inserts, e.g. ring-shaped inserts, at least partially covering the edges of the one or more holes. Preferably, the insert provides the bolt with a further controlled and smoothed motion through the one or more holes. In the presence of an insert, it is preferred that the gap between the bolt and the insert is sufficiently small to allow a close fit of the bolt. Preferably, the gap between the bolt and insert is no more than 1cm, preferably no more than 5mm, preferably no more than 4mm, preferably no more than 3mm, preferably no more than 2mm, and most preferably no more than 1 mm.

Embodiments

[0043] As set out in the claims and elsewhere herein, the invention provides, amongst others, the following embodiments:

1. A dead bolt mechanism (3), comprising a dead bolt (20) which is thrown between retracted and projecting positions by a driving bit (12) engaging and driving a cam (16) that in turn engages and drives a cam follower (18) on the dead bolt (20).

2. A dead bolt mechanism according to embodiment 1, wherein lateral movement of the cam while driving the cam follower is greater than the lateral movement

of the driving bit while driving the cam.

3. A dead bolt mechanism according to embodiment 1 or 2, wherein
the driving bit (12) constitutes a first, inner cam,
the cam (16) constitutes a second, outer cam and comprises a second cam follower (14), and wherein the first, inner cam engages the second cam follower and drives the second, outer cam which in turn engages and drives the dead bolt cam follower (18).

4. A dead bolt mechanism according to any preceding embodiment, comprising a rotary driving bit and a rotary cam.

5. A dead bolt mechanism according to embodiment 4, wherein the rotational axes of the driving bit and cam are offset from each other.

6. A dead bolt mechanism according to any preceding embodiment, wherein the driving bit disengages the cam after the cam has moved the dead bolt into its retracted or projecting position.

7. A dead bolt mechanism according to any preceding embodiment, comprising a locking mechanism to lock the dead bolt when in the projecting position.

8. A dead bolt mechanism according to embodiment 7, wherein in the projecting position the dead bolt is locked by jamming of a surface (19) of the cam follower on a surface (17) of the cam.

9. A dead bolt mechanism according to embodiment 8, wherein in the projecting position the cam is partially exited from the cam follower causing the respective surfaces to jam when there is inwards force on the dead bolt.

10. A dead bolt mechanism according to any preceding embodiment, comprising a locking mechanism to lock the dead bolt when in the retracted position.

11. A dead bolt mechanism according to embodiment 10, wherein in the retracted position the dead bolt is locked by jamming of a surface of the cam follower on a surface of the cam.

12. A dead bolt mechanism according to embodiments 11, wherein in the retracted position the cam is partially exited from the cam follower causing the respective surfaces to jam when there is outwards force on the dead bolt.

13. A dead bolt mechanism according to any preceding embodiment, wherein movement of the cam is restricted to positions between the retracted (and locked) position and the projecting (and locked) position by one or more stops.

14. A dead bolt mechanism according to embodiment 13, wherein the one or more stops are widenings in the cam body (15) that provide resistance against further cam body rotation once it reaches the retracted (and locked) position or the projecting (and locked) position.

15. A dead bolt locking mechanism (3), comprising a dead bolt (20) which is thrown between retracted and projecting positions by a cam (16) that engages and drives a cam follower (18) connected to the dead bolt (20),
wherein in the projecting position the mechanism is locked by jamming of respective surfaces (17, 19) on the cam and cam follower.

16. A dead bolt locking mechanism according to embodiment 15, wherein in the projecting position the cam is partially exited from the cam follower causing the respective surfaces to jam when there is inwards force on the dead bolt.

17. A dead bolt locking mechanism according to embodiment 15 or 16, wherein in the retracted position the mechanism is locked by jamming of respective surfaces on the cam and cam follower.

18. A dead bolt locking mechanism according to embodiment 17, wherein in the retracted position the cam is partially exited from the cam follower causing the respective surfaces to jam when there is outwards force on the dead bolt.

19. A dead bolt locking mechanism according to any of embodiments 15-18, wherein movement of the cam is restricted to positions between the retracted (and locked) position and the projecting (and locked) position by one or more stops.

20. A dead bolt locking mechanism according to embodiment 19, wherein the one or more stops are widenings in the cam body (15) that provide resistance against further cam rotation once the cam reaches the retracted (and locked) position or the projecting (and locked) position.

21. A dead bolt locking mechanism according to embodiment 19 or 20, wherein the one or more stops prevent the cam from fully exiting the cam follower when the dead bolt is in the projecting position and/or retracted position.

22. A lock (1) comprising a dead bolt mechanism according to any of embodiment 1-14 and, optionally, a latch bolt mechanism (2).

23. A lock according to embodiment 22, comprising a front support plate (24).

24. A lock according to embodiment 23, wherein the front support plate comprises one or more holes (28) to provide lateral support for the dead bolt and/or a latch bolt.

25. A lock according to embodiment 24, wherein the front support plate is for attachment to a frame on the other side from the dead bolt mechanism and the one or more holes comprise inserts (30) that provide the dead bolt and/or latch bolt with a close fit and a smooth and controlled motion through the one or more holes.

[0044] The invention hence provides a dead bolt mechanism with a long throw, wherein the same mechanism that produces the long throw also locks the dead bolt. Still further the invention provides a bolt support plate for protecting locking bolts, e.g. dead bolts and latch bolts, from lateral impacts, as well as helping to provide the bolts with a smooth and controlled motion when being moved between retracted and projecting positions.

Examples

Reference Key

[0045]

Gate Lock (1)
Latch bolt mechanism (2)
Dead bolt mechanism (3)
Latch bolt (4)
Gate lock body (5)
Euro cylinder (10)
Driving bit (12)
Outer cam aperture (14)
Cam body (15)
Cam (16)
Cam jamming surface (17)
Cam follower (18)
Cam follower jamming surface (19)
Dead bolt (20)
Dead bolt channel (22)
Front support plate (24)
Gate stile (26)
Front support plate holes (28)
Brass inserts (30)
Resistance point (32)
Screws (34)
Screw holes (36)
Flip over spring (38)

[0046] The invention is now illustrated in specific examples, with reference to the accompanying drawings, in which:

Fig.s 1A and B respectively show a schematic side and front view of a gate lock and front support plate, according to the invention;
Fig.s 2 - 6 show schematic side views of the dead bolt mechanism of figure 1 in various positions;
Fig. 7 shows an exploded schematic side view of the dead bolt locking mechanism; and
Fig. 8 shows a schematic side view of a gate lock, in which a dead bolt mechanism comprises a flip over spring.

Example 1 - Dead Bolt Mechanism

[0047] Fig. 1 shows a gate lock (1) incorporating a latch bolt mechanism (2) and a dead bolt mechanism (3), mounted on a gate stile (26) with screws (34) threaded through screw holes (36) and the gate stile to secure the lock body (5) on one side to the front support plate (24) on the other.

[0048] The dead bolt mechanism (3) comprises a Euro cylinder (10) fixed within a rotating cam body (15). Key-driven operation of the Euro cylinder (10) drives a cam (16) that throws the dead bolt (20) between retracted and projecting positions.

[0049] The front support plate (24) is located on the other side of the gate stile (26) and provides support for the latch bolt (4) which passes through the stile from one side to the other, in order to resist lateral movement and reduce the effect of side impacts on the latch bolt (4) being transmitted to and damaging the latch bolt mechanism (2). In use, the latch bolt (4) is constantly being moved between retracted and projecting positions by the action of slamming the gate and opening it with the handle (not shown). A hole is provided through the stile for each bolt to pass through but these are generally significantly larger in diameter than the bolt with such a large clearance all around that the bolt is effectively isolated in mid-air. Hence, absent the support plate side impacts on the latch bolt (4), which are particularly common when opening and closing the gate to which the gate lock (1) is fitted, cause damage.

[0050] The front support plate (24) also provides similar distal support for the dead bolt (20), in order to resist lateral movement and reduce the effect of side impacts on the dead bolt (20) being transmitted to and damaging the dead bolt mechanism (3). The front support plate is particularly useful when there is a significant gap between the body of the lock and the cavity (not shown) in which the latch bolt (4) and dead bolt (20) must engage when in projecting positions.

[0051] The front support plate (24) in Fig. 1 is provided with two holes (28) in the surface that have slightly larger diameters to the dead bolt (20) and latch bolt (4) for which the edges of the holes will provide support. The edges of the holes are provided with circular brass inserts (30) that allow a close fit of the dead bolt (20) and latch bolt (4) into the holes (28). Each brass insert is durable and corrosion-resistant, allowing it to provide a low friction

surface for movement of the dead bolt (20) and latch bolt (4) back and forth through the holes (28), while the close fit assists in providing protection against damage to the dead bolt mechanism (3) and the latch bolt mechanism (2). Additionally, the increased lateral support for the latch bolt provides a smoother slamming action of the gate.

[0052] The front support plate attaches to the exterior surface of the gate stile (26), whilst the dead bolt mechanism (3) is positioned parallel to the support plate (24) on the other side of the stile (26). Apertures in the gate stile (26) allow movement of the dead bolt (20) through the internal surface of the stile (26).

[0053] As the dead bolt (20) passes through the hole (28) and the insert (30) in the front support plate (24), its movement is steadied and guided into the cavity (not shown) in which the dead bolt (20) must engage when thrown to secure the gate.

[0054] Figures 2 - 6 show the dead bolt mechanism (3) in the gate lock (1) of Fig. 1. Movement between the retracted (and locked) position - see Fig. 2 - and the projecting (and locked) position - see Fig. 6 - will now be explained.

[0055] Upon turning of the key in the Euro Cylinder (10), the driving bit (12) begins rotating around the circumference of the cylinder until it engages the outer cam aperture (14) of the cam body (15) - see Fig. 3. Further rotation of the driving bit (12) then begins to move the cam (16) - see Fig. 4 - around the same plane as the driving bit (12), in turn driving the cam follower (18) and throwing the dead bolt (20), until the driving bit (12) disengages the outer cam aperture (14) - see Fig. 5 - and the cam (16) is prevented from further movement in the same direction by a cam stop (not shown). The cam (16) will have completed one movement from a retracted position to a projecting position, wherein the cam follower (18) is attached to a dead bolt (20) that has slid along a channel (22) causing the dead bolt (20) to be thrown so as to project away from the dead bolt mechanism (3) and hence into its 'projecting position'.

[0056] As the driving bit (12) disengages the outer cam aperture (14), the cam (16) remains in a position partially exited from the cam follower (18) cavity - see Fig. 5. The partial exiting of the cam (16) is effective to prevent force inwards on the dead bolt, absent turning of the key, to cause reverse movement of the cam follower (18), and hence dead bolt (20), from the projecting position to the retracted position. Any inward force applied to the dead bolt (20) is countered by the edge surface (19) of the cam follower (18) jamming on the upper surface (17) of the cam (16) - see Fig. 7 - at a resistance point (32), and the direction of force is redirected towards the rotational centre of the cam (16) preventing movement of the dead bolt (20).

[0057] Only upon reverse movement of the driving bit (12) can the jamming surfaces (17, 19) be disengaged, by the driving bit (12) engaging the outer cam aperture (14) to move the cam (16) backwards, releasing the jamming surfaces. Further backwards movement of the driving bit moves the cam follower (18), and hence dead bolt (20), back into the retracted position.

[0058] Movement back into the retracted position is as follows.

[0059] Upon reverse turning of the key in the Euro Cylinder (10), the driving bit (12) begins rotating around the circumference of the cylinder, from the Fig. 6 position, until it engages the outer cam aperture (14) of the cam body (15) - see Fig. 5. The driving bit (12) then begins to move the cam (16) - see Fig. 4 - around the same plane as the driving bit (12), in turn driving the cam follower (18) and retracting the dead bolt (20), until the driving bit (12) disengages the outer cam aperture (14) - see Fig. 3 - and the cam (16) is prevented from further movement in the same direction by a cam stop (not shown). The cam (16) will have completed one movement from a projecting position to a retracted position, wherein the cam follower (18) is attached to a dead bolt (20) that has slid along a channel (22) causing the dead bolt (20) to move back into its 'retracted position'.

[0060] As the driving bit (12) disengages the outer cam aperture (14), the cam (16) remains in a position partially exited from the cam follower (18) cavity - see Fig. 3. The partial exiting of the cam (16) is effective to prevent outward force on the dead bolt, absent turning of the key, to cause movement of the cam follower (18), and hence dead bolt (20), from the retracted position to the projecting position. Any outward force applied to the dead bolt (20) is countered by an edge surface of the cam follower (18) jamming on an upper surface of the cam (16) at a resistance point (not shown, but corresponding to the surfaces and resistance point shown in Fig. 7), and the direction of force is redirected towards the rotational centre of the cam (16), effectively locking the mechanism and preventing movement of the dead bolt (20).

[0061] Only upon forwards movement of the driving bit (12) can the jamming surfaces be disengaged, by the driving bit (12) engaging the outer cam aperture (14) to move the cam (16) forwards, releasing the jamming surfaces. Further forwards movement of the driving bit moves the cam follower (18), and hence dead bolt (20), back into the projecting position.

[0062] The position of the dead bolt (20) relative to the channel (22) is adjustable by a known means of a set screw (not shown) in the axial direction of the dead bolt (20), accessible through an axial passageway in the dead bolt (20). In this way, the distance over which the dead bolt (20) outwardly projects can be adjusted.

[0063] The combination of the driving bit (12) driving a cam (16), which in turn drives a cam follower (18), namely the arrangement as described above and depicted in figures 2 - 6, has a multiplier effect, increasing the distance the dead bolt (20) can be thrown for a standard rotation from a known Euro cylinder (10). As illustrated, rotation of the outer point of the driving bit (12) describes a first circle and rotation of the innermost point of the cam aperture (14) describes a second circle with a greater di-

ameter than the first and with a centre offset from the first. The circles intersect, thus the paths of the driving bit (12) and cam aperture (14) intersect, allowing the driving bit (12) to engage and drive the cam aperture (14) so as to move the cam (16) (further outwardly spaced from the centre of rotation) a greater lateral distance (approx. 30mm) than the lateral distance travelled by the driving bit (approx.. 18mm) during its engagement in the cam aperture (14).

[0064] The jamming surfaces (17, 19), provided on the cam and cam follower, respectively, prevent movement of the dead bolt (20) without turning the key and without the need for a separate mechanism to lock the dead bolt (20) in the projecting and retracted positions.

[0065] The front support plate (24) protects the dead bolt mechanism (3) from side impacts on the dead bolt (20).

Example 2 - Bolt Support Plate

[0066] The bolt support plate (24) in Fig. 1 is provided with two holes (28) in the surface that have slightly larger diameters to the dead bolt (20) and latch bolt (4) for which the edges of the holes will provide support. The edges of the holes are provided with circular brass inserts (30) that allow a close fit of the dead bolt (20) and latch bolt (4) through the holes (28). Each brass insert is durable and corrosion-resistant, allowing it to provide a low friction surface for movement of the dead bolt (20) and latch bolt (4) back and forth through the holes (28), while the close fit assists in providing lateral protection against damage to the dead bolt mechanism (3) and the latch bolt mechanism (2).

[0067] The invention hence provides a dead bolt mechanism and a means for protecting that mechanism from lateral impacts.

Claims

1. A bolt support plate (24) for fitting to a door or gate (26) and connectable with a lock having a lock body (5) on an opposing surface of the door or gate, comprising one or more holes (28), wherein the edges of the holes provide a bolt, e.g. a latch bolt or a dead bolt of the lock, with a close fit, thereby providing lateral support for the bolt.

2. A bolt support plate according to claim 1, wherein the edges of the one or more holes comprise one or more inserts (30) for providing a close fit between the bolt support plate and a bolt, so as to provide a smooth and controlled motion of the bolt through the one or more holes.

3. A bolt support plate according to claim 2, wherein the one or more inserts is a brass ring.

4. A bolt support plate according to any preceding claims, comprising a hole for a latch bolt and/or a hole for a dead bolt.

5. A bolt support plate according to any preceding claims, comprising means for attaching the bolt support plate to a gate or door.

6. A bolt support plate according to claim 5, wherein the means for attaching the bolt support plate to a gate or door comprise one or more holes for receiving screws (36), which screws pass through the gate or door and secure into the lock body.

7. A kit comprising a lock and a bolt support plate of any of claims 1 to 6, wherein the lock comprises one or more bolts, being a latch bolt or a dead bolt or both a latch bolt and a dead bolt, and the edges of the one or more holes of the bolt support plate provide the one or more bolts with a close fit thereby providing lateral support to the one or more bolts when the lock and the bolt support plate are fitted to a door or gate.

8. A kit according to claim 7, wherein the lock comprises a dead bolt, the dead bolt (20) being thrown between retracted and projecting positions by a driving bit (12) engaging and driving a cam (16) that in turn engages and drives a cam follower (18) on the dead bolt.

9. A kit according to claim 7 or 8, wherein the lock comprises a dead bolt which is thrown between retracted and projecting positions by a cam that engages and drives a cam follower on the dead bolt,
wherein in the projecting position the mechanism is locked by jamming of respective surfaces (17, 19) on the cam and cam follower.

10. A stile of a gate or door, to which is attached a kit according to any of claims 7-9.

11. A dead bolt locking mechanism (3), comprising a dead bolt (20) which is thrown between retracted and projecting positions by a cam (16) that engages and drives a cam follower (18) connected to the dead bolt (20),
wherein in the projecting position the mechanism is locked by jamming of respective surfaces (17, 19) on the cam and cam follower.

12. A dead bolt locking mechanism according to claim 11, wherein in the projecting position the cam is partially exited from the cam follower causing the respective surfaces to jam when there is inwards force on the dead bolt.

13. A dead bolt locking mechanism according to claim 11 or 12, wherein the dead bolt is thrown between

retracted and projecting positions by a driving bit (12) engaging and driving a cam that in turn engages and drives a cam follower on the dead bolt.

14. A lock (1) comprising a dead bolt mechanism according to any of claims 11-13 and, optionally, a latch bolt mechanism (2), the lock further comprising a bolt support plate (24), wherein the bolt support plate comprises one or more holes (28) with edges that provide lateral support for the dead bolt and, if present, latch bolt, and wherein the bolt support plate is for attachment to e.g. a gate stile on the other side from the dead bolt mechanism.

15. A lock according to claim 14, wherein the edges of the one or more holes comprise inserts (30) that provide the dead bolt and/or latch bolt with a close fit and a smooth and controlled motion through the one or more holes.

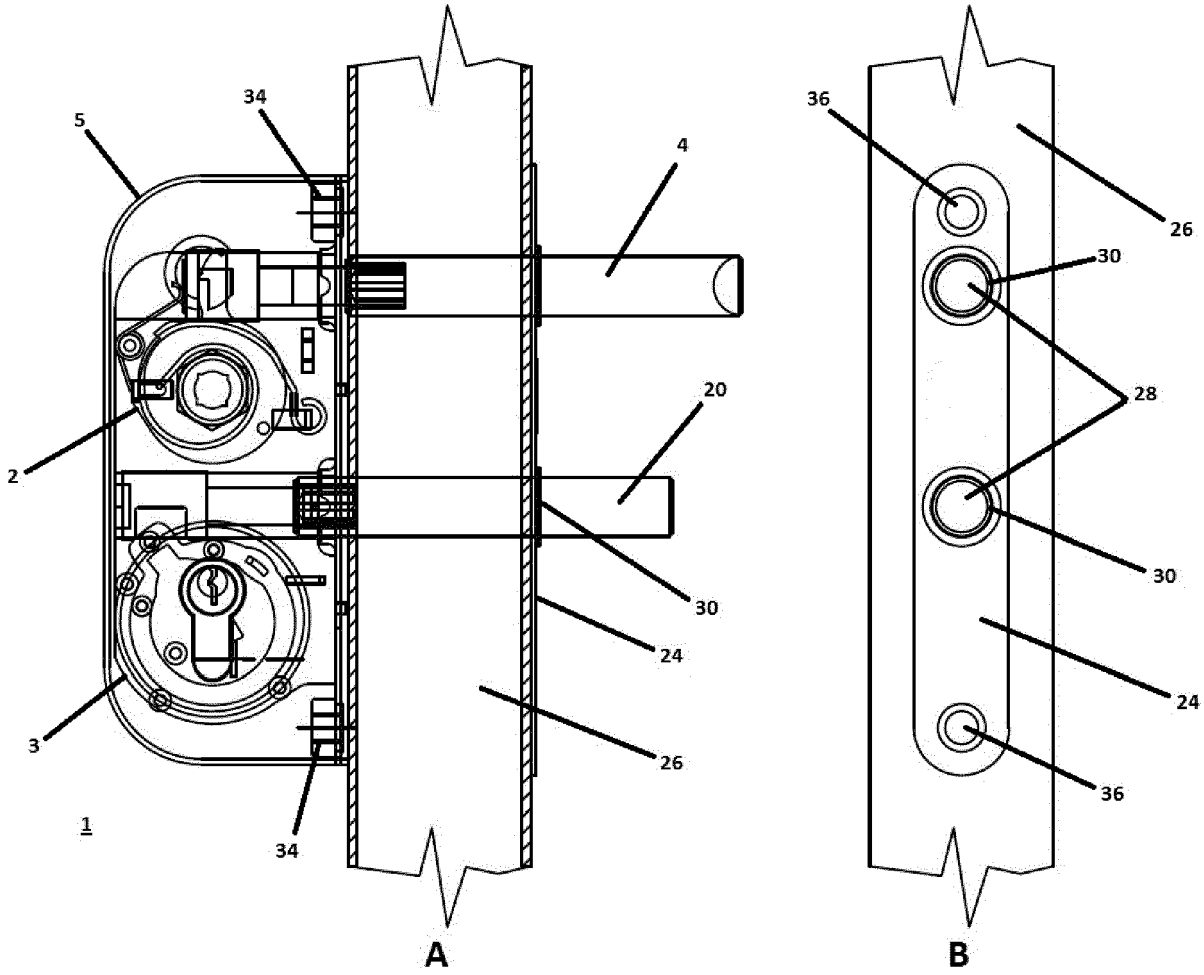


Fig. 1

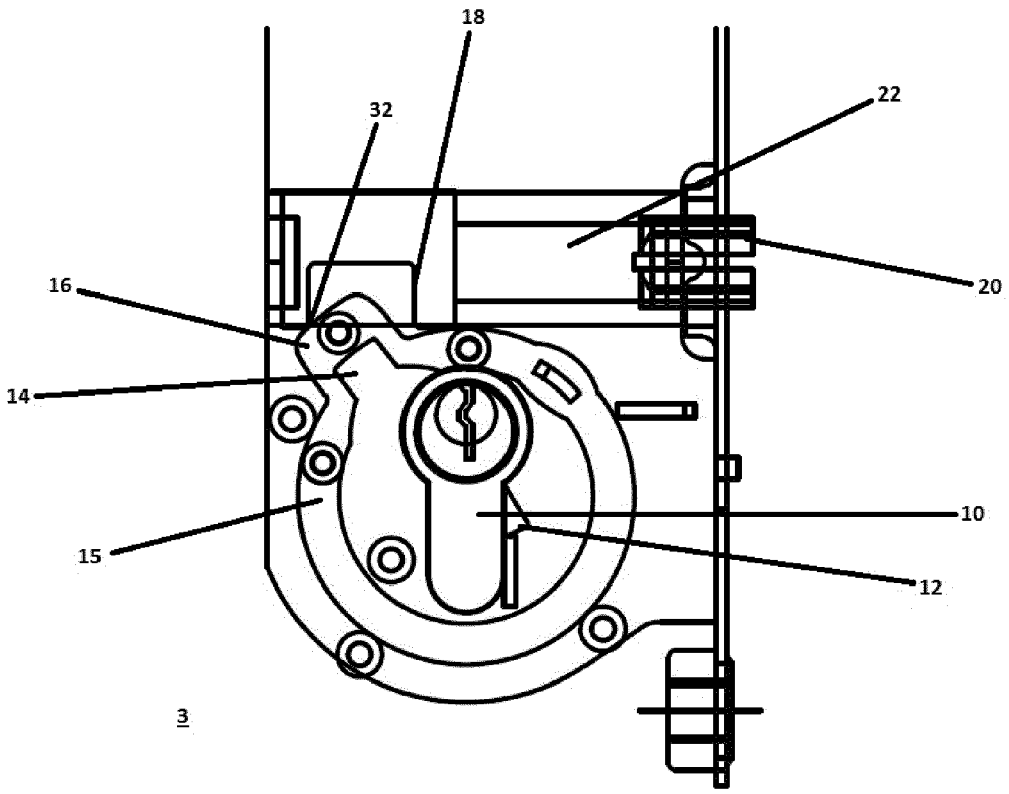


Fig. 2

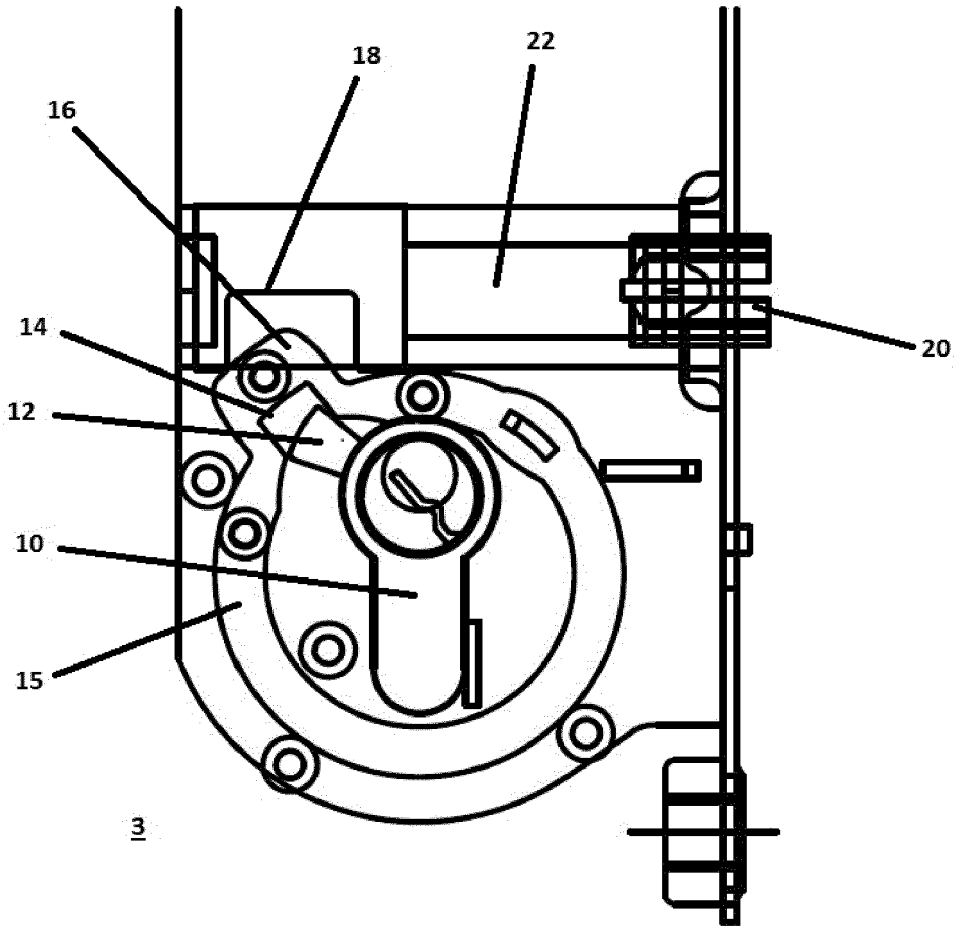


Fig. 3

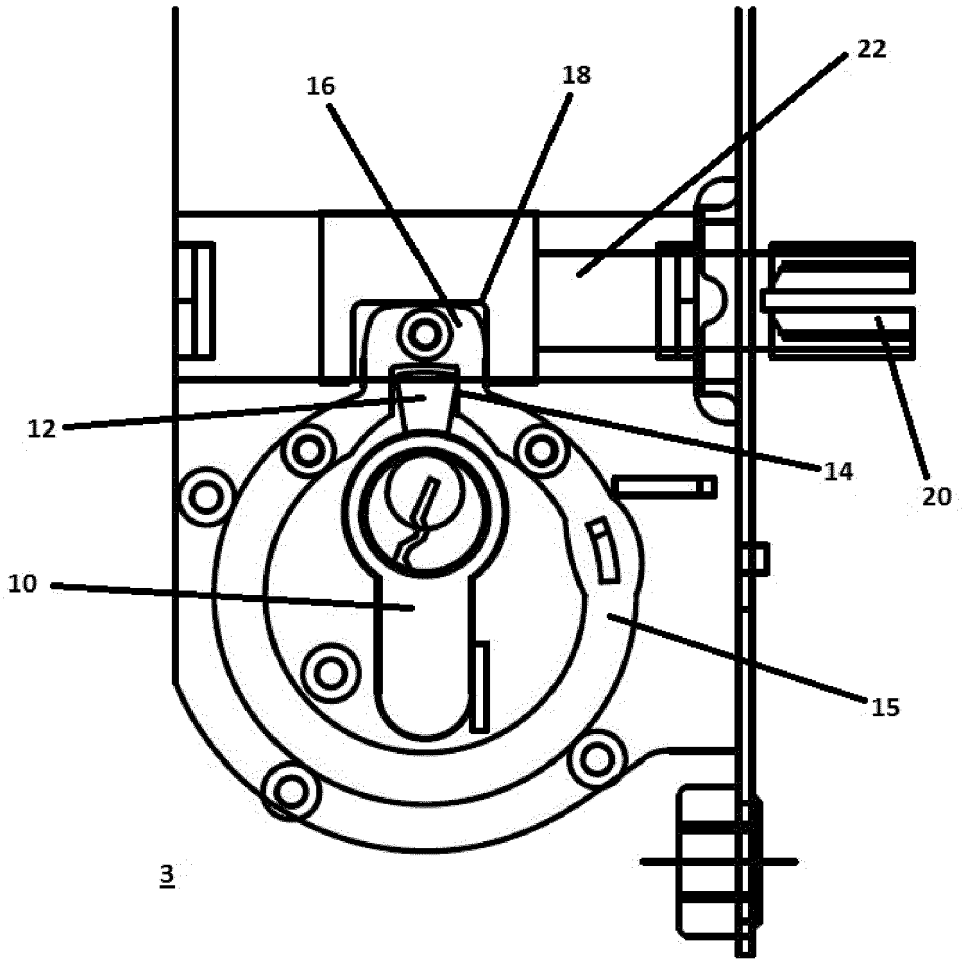


Fig. 4

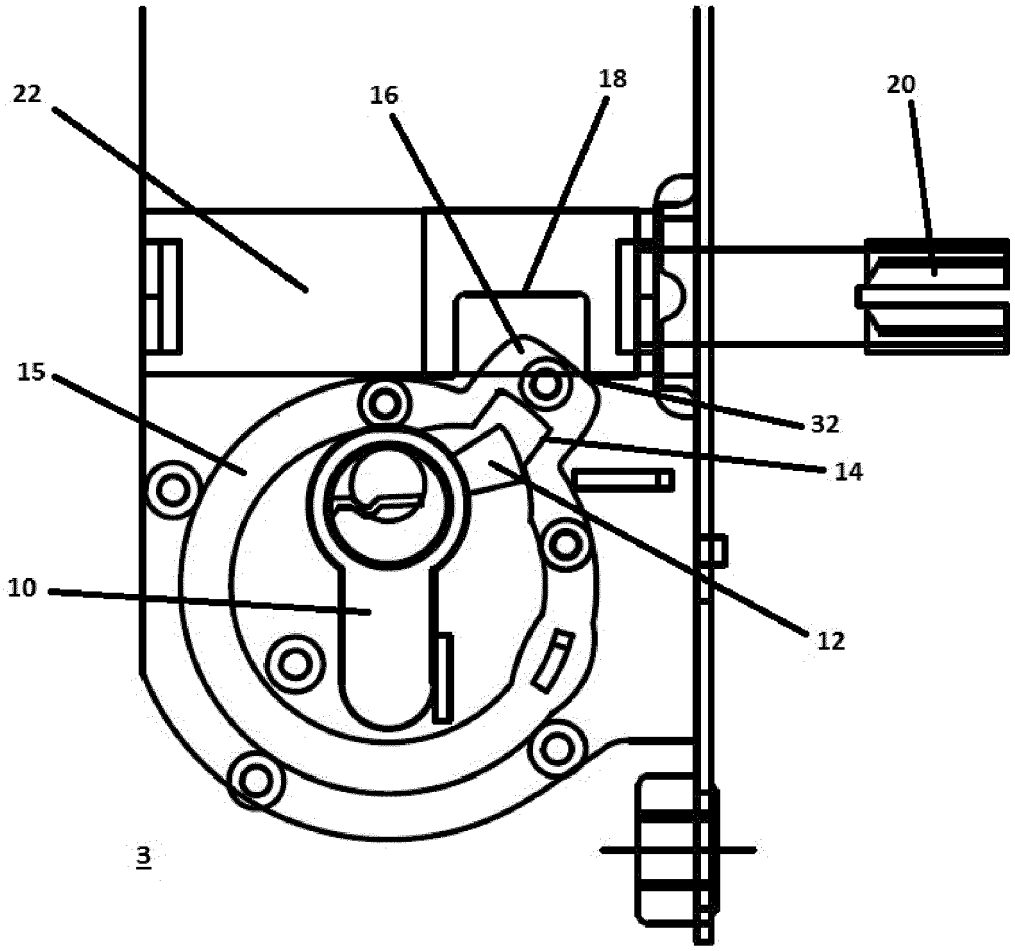


Fig. 5

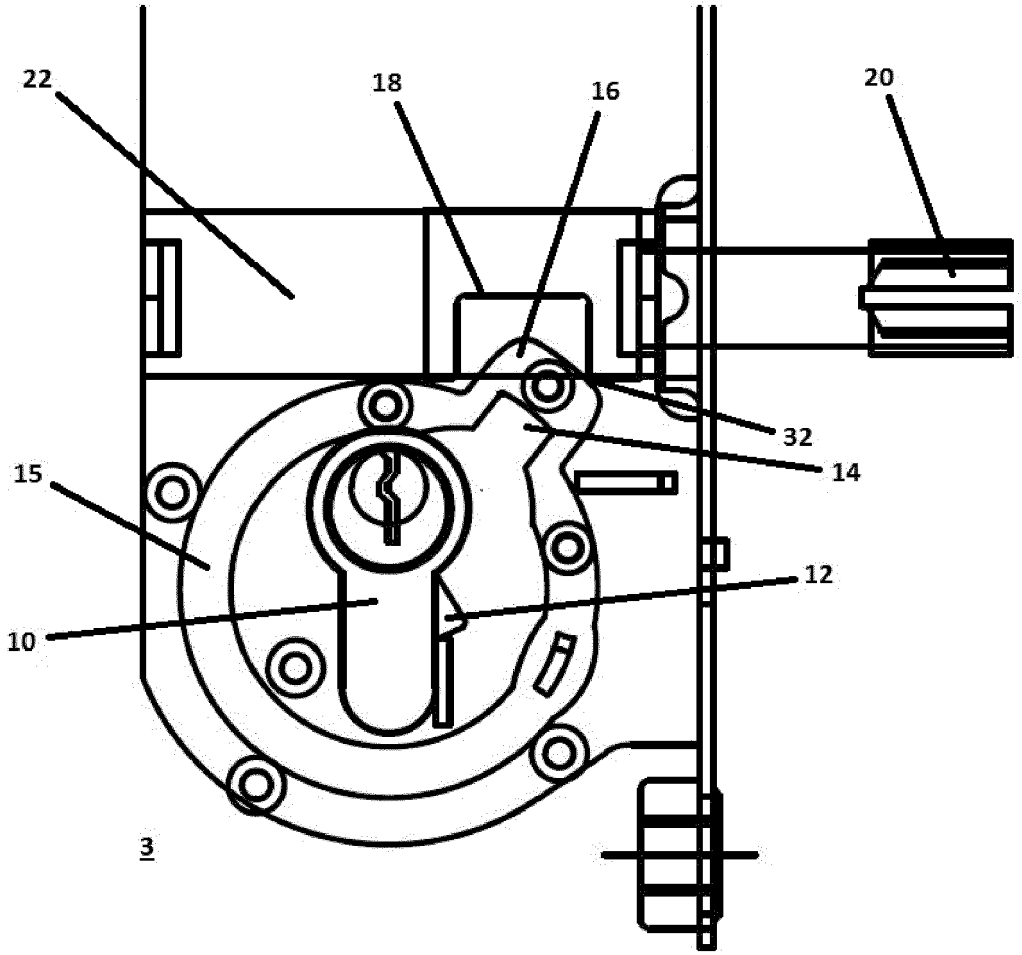


Fig. 6

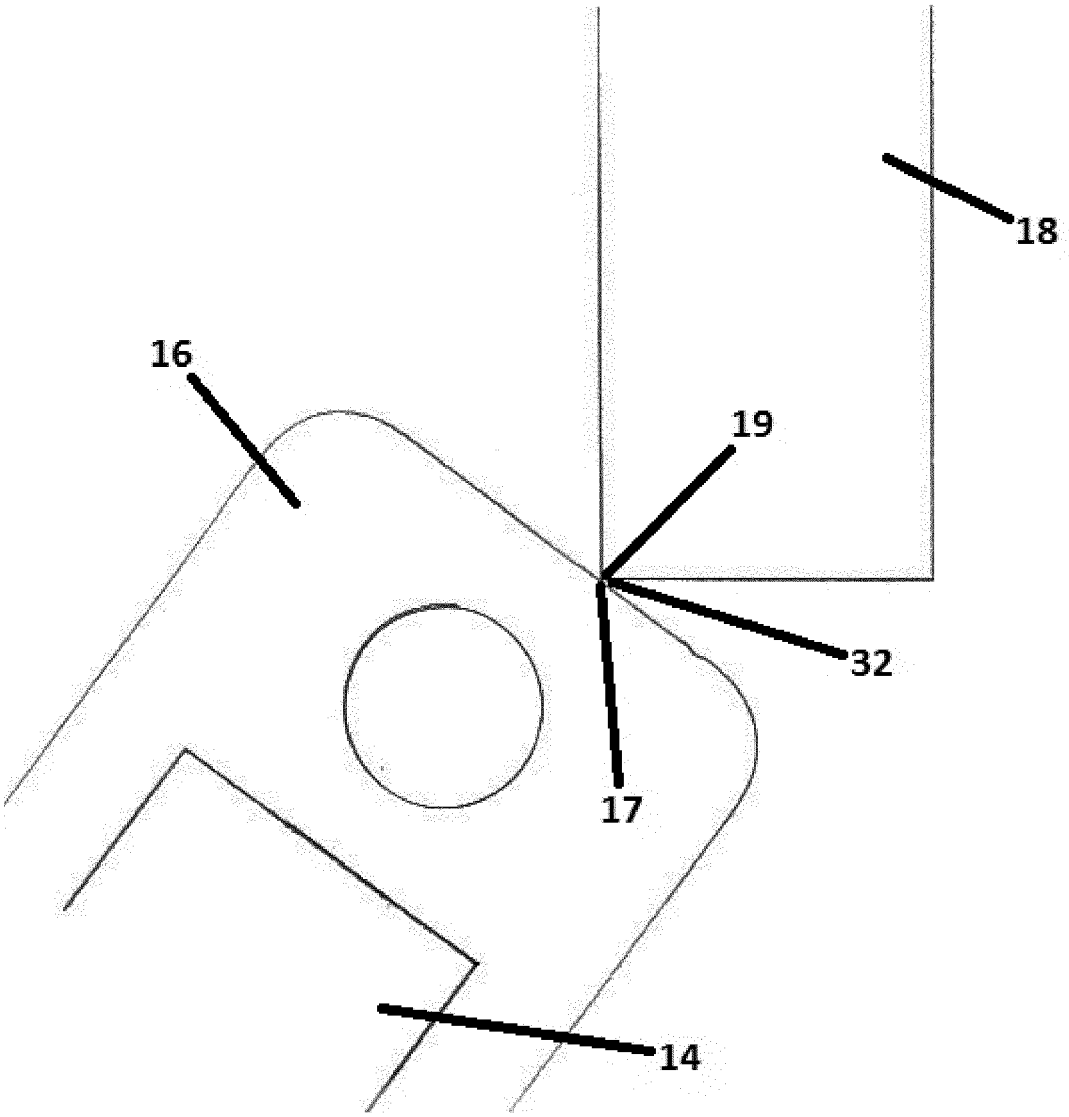


Fig. 7

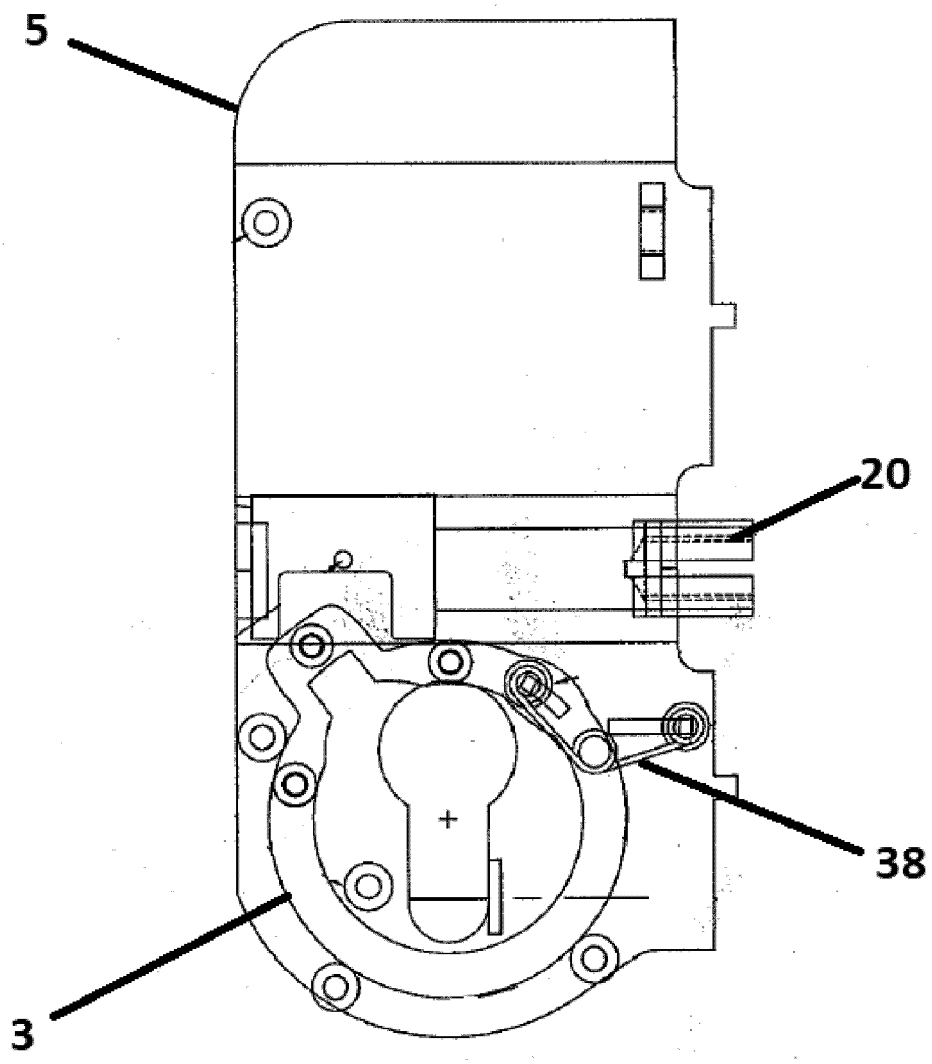


Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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