



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.01.2015 Bulletin 2015/02

(21) Application number: **13175155.4**

(22) Date of filing: **04.07.2013**

(51) Int Cl.:
E05B 17/20 (2006.01) **E05B 63/20** (2006.01)
E05B 45/02 (2006.01) **E05B 15/02** (2006.01)
E05B 17/00 (2006.01) **E05B 45/08** (2006.01)
E05B 55/12 (2006.01) **E05B 63/18** (2006.01)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(54) **Strike plate and lock**

(57) The present invention provides a lock having a bolt (7), fitted to a door (1) that can move between a closed position and an open position. When the door is in the closed position, the lock bolt projects into a recess in the door frame (10) to lock the door. The bolt (7) can be moved into a retracted position by a key- or a knob-operated lock cylinder (57) to unlock the door. The lock has a holdback (30) for holding the bolt in its unlocked position after the key has been removed, thereby allowing the door to be opened without the user having to keep it open. The lock also has a lock actuator (6,20) that releases the bolt from the holdback as the door is closed and the bolt is then projected by a spring (51) into the recess to lock the closed door. The lock actuator includes a trigger bar (6) that is separate from the bolt (7) to release the bolt from its retracted position when the door is closed. Such a trigger bar (6) is biased by a spring (12) so that it projects out of the lock when the door is opened but is forced back into the lock by the surrounding door frame (8) when the door is closed. It is the latter action that releases the bolt (7) from its retracted position and it is held in its retracted position from the time that it is withdrawn by the lock. The trigger bar (6) is connected to a central operating mechanism (20) which is connected to the bolt (7) via a spring (51) such that when the trigger bar (6) is retracted as when it meets the strike plate (9) the bolt (7) is forced forwards via the spring (51). The springs (12 and 51) are arranged together with the central operating mechanism (20) such that when a backwards force is removed from trigger bar (6) it projects forwards thus retracting the bolt (7) backwards.

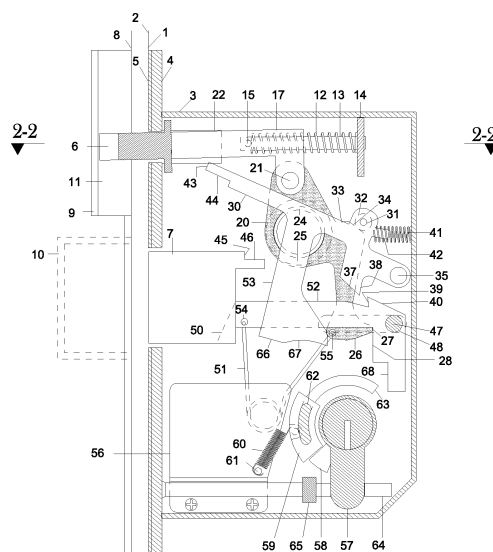


Fig.1

Description

Technical Field

[0001] The present invention relates to a lock that can be used as part of door hardware and especially to a lock for use in locking a swinging door panel in a closed position with respect to a door casing. The structure of the lock includes a bolt, for example a dead bolt, movable into and out of engagement with a strike plate which may be installed on a door frame. Although the lock of the present invention can be used to lock objects other than doors, e.g. windows, it will be described in the present specification primarily in connection with doors, although it must always be remembered that the lock has wider uses beyond the locking of doors.

Background Art

[0002] A common latch lock (known in the trade as a "night latch") that is used to lock a door is mounted on the internal face of the door. Often an additional lock is provided to lock the door, which may be a mortise deadlock. With such an arrangement, on shutting the door, the night latch locks automatically and any additional or auxiliary locks, e. g. a mortise lock, must be locked manually by key (if locked from the outside) or with a key or a thumb turn (if locked from the inside).

[0003] An existing and very successful automatic deadbolt night latch is described in US2519808 which includes a trigger bar and a dead bolt, both of which are spring projected outward of the casing. The lock has a central operating cam to suitably control the movement of the bolt and the trigger bar so that when one is projecting, the other is retracted. In this existing assembly the spring force exerted on the trigger bar is greater than the spring force exerted on the bolt so that, if the forward movement of the trigger bar is not prevented by the door frame, then its spring will cause the trigger bar to be projected forwards and would overcome the force exerted by the weaker bolt spring, which would then be retracted. With such an arrangement, if the lock is located against a doorframe, thereby preventing the trigger from being projected forwards, then the bolt projects forwards but if the trigger is not blocked by the doorframe, it will project from the lock and the bolt will be held in the retracted position.

[0004] DE37 00 891 discloses a lock having a bolt that can be retracted by a key and held in an unlocked position by a hook that is disengaged by a trigger bar when it is pushed into the lock on closing the door. The lock also has a further handle that can be used to operate the bolt but the handle is prevented from operating by an electromagnet unless the electromagnet is released, e.g. in an emergency or during a power cut.

[0005] US 4 262 504 discloses a lock having a bolt and a trigger bar. The action of pushing the trigger bar into the lock causes the bolt to be extended, which tensions

a spring. A catch prevents the bolt from being retracted by the spring, whereby the lock is in a locked condition. The catch can be removed by an electronic plunger (or manually in an emergency) thereby allowing the spring to withdraw the bolt and unlock the lock.

[0006] US 6 196 035 discloses a lock that includes a bolt, a trigger bar and a bolt. The pushing in of the trigger causes the spring to engage behind the bolt to extend the bolt and lock the lock. A user can disengage the spring and retract the bolt to unlock the lock.

Disclosure of the Invention

[0007] As described later, the present invention provides a lock that locks automatically on closure of the door. The lock of the present invention can be used as a primary or as an auxiliary bolt lock. This enables a door to be locked automatically by two or more independent locks, simply by the action of closing the door. The lock may be a deadlock, that is to say a lock with a bolt that cannot be moved from a locked configuration to an unlocked configuration by engaging the bolt externally and forcing it inwards into the lock.

[0008] The terminology in the art is confusing. The term "deadbolt" is sometimes used to indicate a bolt having a square section, i.e. have sidewalls that generally lie in a plane that is parallel to the direction of motion of the bolt, so that an implement engaging the bolt from outside cannot get any purchase on the bolt to force it inwards to retract the bolt. Thus the term "deadbolt" is used to draw a contrast between such a bolt and a "latch bolt" that has a curved or chamfered sidewall that pushes the bolt inwards on engagement with an object, for example a door-frame or strike plate, to allow the door to close. This terminology will be used in the present specification. However, another meaning of the term "deadbolt" denotes a bolt that is opened and closed solely by turning a key or a knob, without intervention of a spring and the term "deadbolt" used in this specification is not used in this latter sense and its use should not be taken to imply that there is no spring between the bolt and the opening key or knob.

[0009] The invention is defined in the accompanying claims.

[0010] Generally speaking, the lock of the present invention has a bolt, which is often a deadbolt, and is designed to be fitted to a door (or other openable leaf) that can move between a closed position and an open position. In the closed position, the lock bolt can project into a recess in a structure surrounding the door, e.g. a door frame, to lock the door. The recess is usually provided in a wear-resistant plate affixed to the structure called a "strike plate". In the present specification, it is assumed that a strike plate will be present but it may not be necessary, e.g. if the door frame is metallic. The bolt can be moved into a retracted position by a key or a knob to unlock the door and allow it to be opened (so long as there is no other mechanism keeping it closed). The knob

(sometimes called a "thumb turn") is usually provided inside a building to allow a user to open the door and exit without the use of a key, whereas a key is needed to open the lock from the outside. In the lock of the present invention, once the bolt is moved to its retracted position, it is held by the lock in that retracted position, thereby allowing the key to be removed and the door to be opened.

[0011] Previously proposed automatically locking deadbolt locks require, when opening a door, that the deadbolt is held in a retracted position by means of, for example, a key or a thumb turn turned in the lock and held manually in that retracted position until the door has been physically opened, i.e. the lock has been moved free of the door frame and its associated strike plate. The present invention allows the lock to be moved into an unlocked configuration and remain in that unlocked configuration without manual intervention when the door is still closed, thereby avoiding the need for a user to hold the bolt in a retracted position by means of a key or other force of retraction until the door is physically opened. Thus the lock remains automatically held in the unlocked position so that other locks can be unlocked and thus the door becomes free to open.

[0012] The lock includes a trigger bar that is separate from the bolt to release the bolt from its retracted position when the door is closed. Such a trigger bar is spring biased so that it projects out of the lock when the door is opened but is forced back into the lock by the surrounding door jamb when the door is closed. It is common that such a trigger bar is used in automatically locking locks to release the bolt but this can be problematic in that the bolt can accidentally be released by the user while the door is still open, requiring the bolt to be unlocked again before the user can close the door. The lock arrangement of the present invention uses the trigger bar to control the bolt such that while the trigger bar is projecting the deadbolt will always be retracted. In practice this means the lock arrangement described cannot be manipulated while the door is open so as to render the door impossible to close as with other automatically locking locks but in fact will ensure that the door may always be subject to being automatically locked.

[0013] The lock has a hold back for holding the bolt when it is moved to the retracted position, thereby allowing the door to open. The holdback will generally engage the part of the bolt that remains within the lock casing and the engagement can be direct or indirect. The lock also has a lock actuator that releases the bolt from the holdback as the door is closed and projects the bolt into the recess to lock the closed door. The trigger bar generally does not engage in a recess in the strike plate, as would a latch-bolt, but instead, for example, slides over a surface of the strike plate. In other words, the trigger bar does not itself provide any locking action but rather is used to operate the bolt.

[0014] There are known automatically locking locks which have the distinct disadvantage of being prone to

accidental release. This fault in such a lock type can render a door impossible to close without the user having a key to again disengage the bolt and may for instance in the communal use of such a doorway make an automatically locking lock completely unfeasible. It is a feature of the arrangement of the present invention that it overcomes the possibility of accidental or indeed purposeful release of the lock so that it can be always relied on to lock the door and indeed not to leave the door impossible to close if the user does not have a key.

[0015] The arrangement of the present invention is not susceptible to accidental triggering and includes a two-stage hold back. In the first stage, a bolt engagement, e.g. a hook, engages the bolt automatically as the bolt is withdrawn by a key or thumb turn. This engagement may be released when the trigger bar moves into its projecting position as the door is opened. In the second stage, another bolt engagement maintains the bolt in the retracted position and takes over when the first bolt engagement is released. This further engagement is controlled by the action of the trigger bar and may include an arm that engages the bolt when the trigger bar is in its projecting position to maintain the bolt in its unlocked position. However, this further bolt engagement is removed when the trigger bar is moved in its retracted position within the lock casing when the door is closed, thereby allowing the bolt to move into its locked position. Thus if the trigger bar is accidentally pushed in when the door is open, the arm may allow the bolt to move into its locking position but it is moved back into its retracted position when the trigger bar is released. In this connection, the spring force urging the trigger bar into its projecting position should overcome any spring urging the bolt into its locking position, and this is generally preferred.

[0016] The force of the trigger bar spring acting through the arm can maintain the bolt in its unlocked position (while the trigger bar is in its projecting position) thereby maintaining the bolt spring in tension. The action of the trigger bar being moved from its projecting position to its retracted position on engagement with the door jamb causes the arm to allow the bolt to be moved into its locked position using the tension in the bolt spring.

[0017] The springs urging the bolt and the trigger bar to project out of the lock case may be arranged such that they cooperate with each other (rather than acting against each other as is the case in US2519808) therefore reducing the maximum spring force required of the trigger bar spring. In one embodiment, the bolt spring acts between the bolt and the arm so that the movement of the arm to maintain the bolt in its unlocked position reduces the tension in the bolt spring while the movement of the arm to allow the bolt to move into its locking position tensions the bolt spring. Such an arrangement allows the lock to project the bolt further out of the casing, thus significantly improving upon the previously known spring arrangement since the additional projection of the bolt makes it harder to access the front end of the bolt from the outside to withdraw the bolt.

[0018] The arrangement could also be used without a holdback mechanism to operate for instance as a night latch embodying features of the previously mentioned lock while including the improvements associated with the rearrangement of springs. The arrangement of springs also has the benefit in that when withdrawing the bolt the withdrawal force is minimized in that only a single spring force resists the withdrawal and that spring is at the lower end of its resistance levels during said bolt withdrawal process. It is also the force of the weaker of the two springs that the bolt is withdrawn against. These features are taken advantage of by the arrangement described in that a quick release of the lock is also incorporated to allow the lock to be unlocked with minimal rotation of the key by the user.

[0019] In summary, the lock arrangement allows for the release of the first stage of the automatic holdback mechanism once the door is opened since the second stage takes over. This second stage occurs via the trigger bar which is projected forwards on opening of the door and this change in its position automatically releases the bolt from the first stage of the holdback mechanism. However, the spring arrangement within the lock ensures that the bolt is retained in a retracted unlocked position while the door is opened and the lock disengages from the strike plate in readiness for another locking cycle as when the door is again closed. Backwards pressure on the trigger bar (as for instance if the trigger bar were accidentally pushed backwards) whilst the lock is away from the strike plate will give a forwards projection of the deadbolt but when this force is removed the trigger bar projects forward again thus retracting the deadbolt and correcting the lock in readiness for use.

[0020] An arm may be part of a central operating cam, which might control other functions of the lock, e.g. the release of the first engagement and/or the deployment of a deadlock lever, as described below.

[0021] Optionally included in the lock of the present invention are a number of additional optional features such as a rapid release mechanism which reduces the key or thumb turn rotation required to unlock the lock, as set out in the attached claims.

[0022] Also envisaged is a temporary disengagement of the lock so that the door can be closed with the bolt remaining within the lock case. It is envisaged that sometimes the door user may wish to close the door without engaging the lock. While the door is open, the door user (without the use of a tool) can quickly disengage the lock bolt rendering the lock temporarily inoperable.

[0023] Independently the present invention also provided a sonic indicator which reassures the user that the lock has engaged successfully in the strike plate. As it is envisaged by this invention, the lock could be used as one of two or more automatically locking locks operating on the same door. One can imagine how a user, on closing of the door with such usual associated noise, might doubt if a second lock had in fact locked properly. A sonic indicator is proposed which would automatically sound

when the lock bolt has entered the strike plate aperture. It is envisaged within the scope of the invention that this might take the form of an electrical or electronic device with a circuit being formed when the bolt enters the strike plate; the circuit could operate an electrical or electronic sonic emitter to alert the user as appropriate. Such electrical or electronic indicators would require wiring, and a power supply and perhaps specific skills to install, and to that end the sonic indicator may be a simple mechanical device, as described later. According to this embodiment, the sonic indicator assembly described in the invention uses the movement of a bolt into the aperture in the door frame to strike a hammer which strikes a percussion object, for example a bell but this could also be a tuning fork or other percussion object. Although it is possible for the bolt to strike the sonic indicator directly, such an arrangement runs the risk that the bolt will quickly dampen the vibration of the sonic indicator. It is also envisaged within the scope of the invention that said projecting bolt movement might trigger a more elaborate mechanism with greater sonic possibilities, such as a wind up spring operated hammer mechanism or an indicator which could sound within a controlled time period after a door is shut.

[0024] Also included is a deadlocking feature to prevent inappropriate unlocking by external force. The element which controls the deadlocking feature is the same element which facilitates the holdback of the deadbolt and this same element is again engaged directly by the unlocking feature to also remove the deadlock prior to withdrawal of the bolt. The use of a single element to achieve three functions significantly reduces the otherwise multiple elements that might have been required with obvious advantages in terms of cost and complexity.

Brief Description of the Drawings

[0025] Other purposes and advantages of the invention will hereinafter more fully appear or will be fully understood from the following accompanying drawings and descriptions thereof, which are given by way of example only.

Fig. 1 refers to a sectional elevation of an arrangement of the invention with the section taken along section line 1-1 on Fig. 2 with parts being shown in cross section on a vertical plane with the locking device being shown in the fully unlocked state when disengaged from the strike plate and with the strike plate immediately behind.

Fig. 2 refers to a sectional plan of an arrangement of the invention with the section taken through the lock along section line 2-2 on Fig. 1 with parts being shown in cross section on a horizontal plane with the locking device being shown in an unlocked state and about to engage with the strike plate.

Fig. 3 refers to a sectional elevation of an arrangement of the invention with the section taken along section line 3-3 on Fig. 4, this section taken immediately inside the deadlocking device thus the deadlocking device shown dotted, with parts being shown in cross section on a vertical plane and with the locking device being shown engaging with the strike plate during the locking process.

Fig. 4 refers to a sectional plan of an arrangement of the invention with the section taken through the lock along section line 4-4 on Fig. 3 with parts being shown in cross section on a horizontal plane with the locking device being shown engaged with the strike plate.

Fig. 5 refers to a sectional elevation of an arrangement of the invention with the section taken along section line 3-3 on Fig. 4, this section taken immediately inside the deadlocking device thus the deadlocking device shown dotted, with parts being shown in cross section on a vertical plane and with the locking device being shown fully locked and engaged with the strike plate.

Fig. 6 refers to a sectional elevation of an arrangement of the invention with the section taken as along section line 3-3 on Fig. 4, this section taken immediately inside the deadlocking device thus the deadlocking device shown dotted, with parts being shown in cross section on a vertical plane and with the locking device being shown during the latter stages of unlocking while still engaged with the strike plate.

Fig. 7 refers to an enlarged sectional elevation of parts of the arrangement of the invention with the section taken along section line 1-1 on Fig 2, this section taken immediately inside the lock, with parts being shown in cross section on a vertical plane and with the locking device being shown at the latter stages of unlocking while the lock is still engaged with the strike plate as in figure 6.

Fig. 8 refers to a sectional elevation of the arrangement of the invention with the section taken along section line 3-3 on Fig. 4, this section taken immediately inside the deadlocking device thus the deadlocking device shown dotted, with parts being shown in cross section on a vertical plane and with the locking device being shown unlocked and held back while still engaged with a strike plate which in this case is an alternative strike plate encompassing an arrangement for the sonic indicator. This arrangement shown on Fig. 8 of the lock also shows a temporary lock disengagement device which is fixed to the front plate of the lock.

Fig. 9 refers to a frontal elevation of the lock as

viewed along section line 9-9 on Fig. 8, with parts being shown on a vertical plane and parts behind shown dotted as appropriate.

Fig. 10 refers to an elevation of an alternative strike plate as viewed along section line 10-10 on Fig. 8, with parts being shown on a vertical plane and parts behind the strike plate shown dotted as appropriate.

Fig.11 refers to a three dimensional view of the arrangement of the invention showing the major elements of the lock and their relationship to each other with the lock in the locked position.

15 Detailed Description

[0026] The arrangement of the lock shown in figure 1 to figure 11 is fitted on a door 1 with a door edge 2 and is contained in a casing 3 with a front plate 4, and a covering plate 5. The lock has two projecting members, a sliding trigger bar 6 and a sliding deadbolt 7. The door 1 is co-operable with a jamb 8 which carries a strike plate 9 running parallel to the front plate 4 with an aperture 10 in the strike plate 9, said aperture being horizontally aligned with the deadbolt 7. The strike plate 9 also has a cambered face 11 which is aligned with the trigger bar 6.

[0027] The trigger bar 6, the deadbolt 7 and other elements of the lock slide forwards and backwards, "forwards" describing the direction elements of the lock move out of the casing 3, i.e. to the left in figures 1-8 as shown, and "backwards" describing the opposite direction.

[0028] The projecting face of the trigger bar 6 is rounded so that when it meets the cambered edge 11 of the strike plate 9 it is forced backwards into the lock casing 3. The trigger bar 6 is spring projected forwards via a compression spring 12 which runs over a cylindrical runner bar 13 which is held by a fixed slot piece 14 that is secured to the casing. At its other end, the cylindrical runner bar 13 is held on a pin 15 which is fixed between the two projecting arms 16 and 17 (see figure 2) of said trigger bar 6. Trigger bar 6 is connected to a central operating cam 20 by a pin 21 which is also held between the two projecting arms 16 and 17. The front of the trigger bar 6 runs along slots 22 and 23 in the lock casing 3 (figure 2).

[0029] The central operating cam 20 is flat in shape and rotates about a fixed central cylinder 24. Washer 25 sits inside the central operating cam 20 to help to keep said central operating cam aligned as it rotates. One arm 26 of the central operating cam 20 engages with the deadbolt 7 with a face 27 of the central operating cam 20 moving against face 28 of the deadbolt 7 during lock movements.

[0030] A deadlocking arm 30 (shown dotted in figures 3, 5, 6,7 and 8 for clarity of illustration) is a plate like member which rotates about a fixed pin 35. Deadlocking arm 30 has a laterally protruding pin 31 which has a roller pin 32 rotating about pin 31, said roller pin 32 bears

against face 33 and face 34 of the central operating cam 20 so that, when said central operating cam rotates, it in turn rotates the deadlocking arm 30. The deadlocking arm 30 also acts as a holdback hook with face 37 and face 38 of the deadlocking arm 30 acting on faces 39 and 40 of the deadbolt 7. The deadlocking arm 30 is acted on by compression spring 41 which sits between a nib 42 of the deadlocking arm 30 and the lock casing 3. Faces 43 and 44 of the deadlocking arm 30 act on face 45 and face 46 of the deadbolt 7 when the lock is in the locked position.

[0031] The projecting end of the deadbolt 7 slides forwards and backwards through the front plate 4 and the covering plate 5 and on its opposite end the deadbolt 7 has a fixed projecting pin 47 which slides along horizontal slots 48 and 49 (see especially figure 4) in the casing 3, said slots 48 and 49 aiding in maintaining the position of the deadbolt 7. A dotted line 50 in figures 1, 3 and 5 indicates a voided area in the deadbolt 7 said void laterally aligning with a torsion spring 51 to allow a free movement of said spring which operates on the deadbolt 7. The deadbolt 7 has a central shaft 52 that is reduced in thickness to allow an arm 53 of the deadlocking mechanism 30 to move beside it on one side and the arm 26 of the central operating cam to move on its other side (see figure 4). A torsion spring 51 is connected to the deadbolt 7 with one arm of the spring being inserted in a hole 54 in the central shaft 52. The other arm of the torsion spring 51 is inserted into a hole 55 in arm 26 of the central operating cam 20.

[0032] A plate 56 which is fixed to the casing 3 sits outside the torsion spring 51 and helps to laterally restrain said spring in position as it moves backwards and forwards with the deadbolt 7.

[0033] A lock cylinder 57 is located in the lock casing 3 and has a nib 58 rotating a rapid releasing mechanism 59 designed to reduce the rotational path of the key to unlock the lock. An extension spring 60 acts between said rapid release mechanism 59 and a fixed pin 61 which protrudes from the plate 56. The rapid release mechanism 59 has curved projections 62 on either side which slide along slots 63 on either side of the lock casing 3, said slots being cyclically parallel to the rotation of the nib 58. Lock cylinder 57 is held in position by a fixing screw 64 which threads through a fixed threaded member 65. The rapid release mechanism 59 acts on faces 66 and 67 of the deadlocking bar 30 and on face 68 of the deadbolt 7.

[0034] A description of the typical locking and unlocking cycle of the arrangement begins with figures 1 and 2 showing the lock in its configuration when the door is in the open position and about to be shut. The trigger bar 6 is projecting fully forwards due to the influence of compression spring 12. The central operating cam 20 has been rotated anticlockwise to its furthest extent and thus forces the face 27 of arm 26 against face 28 of the deadbolt 7 and thus forces the deadbolt 7 backwards. The movement of pin 47 along slots 48 and 49 controls and

restricts the forwards and backwards movement of the deadbolt 7. At this stage the deadlocking arm 43 is held elevated by the position of the roller pin 32 against face 34 of the central operating cam 20.

5 **[0035]** As the trigger bar 6 meets the cambered face 11 of the strike plate 9 (best seen in the plan view of figure 2) the trigger bar 6 is forced backwards. This movement rotates the central operating cam 20 clockwise forcing arm 26 forwards thus removing the backwards pressure (via face 27) on deadbolt 7 and tensioning torsion spring 51 thus pressuring the deadbolt 7 forwards to meet the strike plate 9 as seen in figures 3 and 4.

10 **[0036]** As the door 2 moves further towards a closing position the trigger bar 6 is forced further backwards and thereby the force on the torsion spring 51 increases until with further closure of the door 2, the deadbolt 7 becomes aligned with the strike plate aperture 10 and the deadbolt 7 projects forwards into the strike plate aperture 10 as seen in figure 5. The rotation of the central operating cam 20 also means that the bearing surface 34 is moved from under the roller pin 32 of the deadlocking bar 30 (see figure 3), which causes the deadlocking bar 30 to drop until face 44 of the deadlocking bar 30 meets face 46 of the deadbolt 7 (see figure 5). With the deadlocking bar 30 in the lowered position, a backwards force on the deadbolt 7 will force face 45 of the deadbolt 7 to meet face 43 of the deadlocking bar 30 thus restricting backwards movement of the deadbolt 7 and providing a deadlocking function.

25 **[0037]** The arrangement is unlocked (see figures 5 to 8) by a rotation of the lock cylinder nib 58 by either a key from the outside or a thumb turn from the inside. The nib 58 rotates the rapid release mechanism 59 against the force of the extension spring 60. The rapid release mechanism 59 initially meets face 66 of the deadlocking bar 30 which slightly rotates (raises) the deadlocking bar 30 thus removing the deadlock function before the deadbolt 7 is to be retracted.

30 **[0038]** A continuance of the rotation of the nib 58 sees the rapid release mechanism 59 meeting face 67 of the deadlocking bar 30 (see figure 7) thus keeping the deadlocking bar 30 raised and out of the path of the deadbolt 7; concurrently the rapid release mechanism 59 meets face 68 of the deadbolt 7 and further rotation of the nib retracts said deadbolt 7 (see figure 6).

35 **[0039]** A further continuance of the rotation (as seen in figure 6 and 7) brings face 37 of the deadlocking bar against face 40 of the deadbolt 7 further rotating the deadlocking bar 30 and raising it until the face 38 of the deadlocking bar 30 aligns with face 39 of the deadbolt 7 and said deadlocking bar rotates anticlockwise due to bias of spring 41 thus hooking on to the deadbolt 7 and retaining the deadbolt in its retracted position as shown in figure 8. The rotational force may now be removed from the key or thumb turn and the rapid release mechanism 59 will return to its original position under the influence of spring 60 allowing the key to be removed if a key was the rotational mechanism.

[0040] The door 1 may now remain in the shut position with the lock in the holdback position until other locks are unlocked and the door is ready to be opened. The arrangement of the present invention makes the unlocking of the other locks easier since there is no need for the user to do anything to maintain the lock of figures 1 to 10 in an unlocked condition while the other locks are unlocked. Once the door 1 is opened the trigger bar 7 will move forwards rotating the central operating cam 20 and raising the roller pin 32 as it does so. This raising of roller pin 32 rotates the deadlocking bar 30 thus raising face 38 which releases the deadbolt 7 from the held back position. Coinciding with the release of the deadbolt 7 the arm 26 of the central operating cam 20 will have rotated backwards, i.e. anticlockwise, to have met face 28 of the deadbolt 7 to restrain its forward movement and so, despite the deadbolt 7 being released from the deadlocking bar 30, the bolt cannot move forwardly. Before the lock has disengaged from the strike plate, the trigger bar 6 will be fully projecting forward and the deadbolt 7 will remain fully withdrawn into the lock casing as in figure 1 and thus the lock will be ready again to reengage with the strike plate.

[0041] At this stage while the lock is disengaged from the strike plate 9 if a user were to force the trigger bar 6 backwards either accidentally or intentionally then the bolt 7 would project forwards from the lock. If the user then removes the force on the trigger bar 6 the bolt retracts back into the lock casing as before. Within this cycle of activity when initial force is put on the trigger bar 6 the deadlocking bar 30 is so arranged that the faces 33 and 34 of the central operating mechanism 20 control the position of the deadlocking bar 30 such that the deadlocking bar 30 is held sufficiently raised when the bolt 7 initially projects forwards that face 39 of the bolt 7 has moved beyond face 38 of the deadlocking bar 30 so as not to impede its path. When the bolt 7 is in a fully projected position and force is again reduced on the trigger bar 6 thus allowing the bolt 7 to return into the case, the faces 33 and 34 of the central operating mechanism 20 again control the deadlocking bar 30 so as to before the bolt is withdrawn to the point where it would be impeded by the deadlocking bar 30 the deadlocking function will be removed.

[0042] Figure 8 and 9 shows an alternative strike plate 69 encompassing an arrangement for a sonic indicator which engages with a lock that has a spring biased forward projecting bolt. Figures 8 and 10 describe this arrangement in connection with the lock as described is the arrangement but any lock that has a spring biased forward projecting bolt may be used instead. This sonic indicator is intended to let a user know that the bolt has projected from the lock into the strike plate when a door has closed. As the lock arrangement in the invention is primarily intended for use as secondary or auxiliary locks it would be convenient to let the user know that the bolt of a lock of this type has projected into the strike plate when the door closes by emitting a noise other than the

noise of a door slam.

[0043] In the arrangement shown, the indicator is in the form of a bell structure 72 set behind the strike plate 69 and is set to ring once the deadbolt 7 projects into said strike plate aperture 78. As seen in figure 8 and 10 a set of rotating hammers 70 hang freely from a cylindrical bar 71 behind the strike plate aperture. Beyond the set of hammers 70 is a bell structure 72. Bar 74 indicates a C shaped holder piece which is fixed to the strike plate at points 75 and 76. The bell structure 72 is held in position at a single point by bolt 73 which screws through bar 74 and through a washer 77 into the bell structure 72. As with the arrangement of lock described, a deadbolt will project from the casing into a strike plate with force and speed due to the deadbolts being spring projected forwards. Once the hammer 70 or hammers have been struck by the deadbolt 7 they will swing upwards to strike the bell 72. Preferably they will immediately drop back down away from the bell as remaining in contact with the bell would reduce the length of time the bell would continue to sound. Different size, shape and weight of bell can influence the sound emitted.

[0044] Also envisaged with the locking device is a temporary disengagement facility as shown in Figs.8 and 9. This is in the form of a disc shaped plate 79 which has shoulder sections on the lock side of the plate, the plate 79 is fixed via a threaded bolt 80 which fits freely through disc 79 to threaded nut 81, threaded nut 81 being fastened against threaded locking nut 82 such that disc 79 is freely rotated about bolt 80 between the limits of lines 83 of covering plate 5, see Fig 9. When the door 1 is open the bolt 7 will be in the retracted position. While bolt 7 is retracted a further slight pressing backwards by the user will push the bolt 7 behind the disc 79 so allowing disc 79 to be rotated clockwise in front of bolt 7 to a point where disc 79 it is limited by slot 83. Releasing bolt 7 will allow the force which acts on bolt 7 to press against disc 79 and help maintain it in position. The disc 79 is arranged such that its centre of gravity encourages it to fall to a position within slots 83 of either locking the bolt 7 inside the lock or when the bolt 7 is in use it is falling to a position where it cannot interfere with bolt 7.

[0045] The invention sets out to solve the problem of creating a secondary or auxiliary door lock which essentially replaces a manually operated deadlock with an automatically locking equivalent. It gives the advantage of including on a door set, a more comprehensive locking system whilst reducing involvement from the user. Obviously the user will not have to lock the lock as this is done automatically but less obviously the user having walked away from the doorway will no longer have to second guess whether they had remembered to double lock or not thus avoiding those all too familiar returns to a doorway to check if the door is locked.

[0046] Two optional features will greatly enhance the user friendliness of the lock over common manually operated locks.

[0047] Firstly the rapid release mechanism will reduce

the aggravation of unlocking a lock because the key turn rotation is much reduced compared to current locks, which enables the lock to be unlocked with one swift motion and without re gripping which is necessary for instance to complete key turn of more than 180 degrees. This is brought about by the use of a rotatable rapid release mechanism 59 having a larger sweep radius than the lock nib and thereby able to drawback the deadbolt 7 a greater lateral distance per degree of turn of the nib than if the deadbolt is withdrawn by the nib itself.

[0048] Secondly the introduction of a sonic indicator greatly reassures the user that the lock is engaged correctly.

[0049] The first feature described above can be used to provide a superior lock in which a deadbolt which will extend further outside of the lock case than is common in deadbolts, thereby greatly enhancing the security of the lock which is often necessary to comply with modern requirements, specifically insurance requirements.

[0050] The scope of the claims hereinafter encompasses the arrangement shown with the additional features specified but also the wider scope of this lock as a type.

Claims

1. A strike plate for use with a lock having a bolt that can be projected towards the strike plate to lock the lock, which strike plate includes

- an aperture for receiving the lock bolt to lock the lock and
- a sonic indicator that is configured to emit a sound in response to the bolt being moved into the aperture, e.g. when contacted directly or indirectly by the bolt

wherein the strike plate optionally includes a movable striker that is located in the path of the bolt and that is configured to contact the sonic indicator when the bolt is moved into the aperture, and/or

wherein the sonic indicator may optionally be an electrical circuit containing a switch located in the aperture that is closed when the bolt is moved into the aperture and a sound generating circuit that is triggered by the switch to emit a sound, and/or wherein the sonic indicator may be a resonator, for example a bell or a tuning fork, that is configured to emit a sound when the bolt is moved into the aperture, e.g. when contacted by the bolt and or by a movable striker that is located in the path of the bolt when moved into the aperture..

2. A lock for securing to a movable body, e.g. a door, and for cooperating with a strike plate on a stationary body, e.g. a door frame, which lock can be moved away from the strike plate, e.g. to open the door, and

moved into juxtaposition with the strike plate, e.g. when the door is being closed, which lock comprises:

- a casing;
- a locking bolt within the casing that is movable between a locking position in which it projects from the casing to engage with a recess in the strike plate and thereby locking the lock, and an unlocked position in which the bolt is retracted from the locking position into the casing and the lock is unlocked;
- a user-operable mechanism for exerting a force that moves the locking bolt from the locking position to the unlocked position;
- a trigger bar that is slidably mounted within said casing and is biased by a first spring in a forward direction towards a projecting position in which it projects from said casing, thereby allowing it to engage the strike plate when the lock is brought into juxtaposition with the strike plate, e.g. on closing the door, the configuration being such that said engagement causes the trigger bar to be pushed backwardly against the action of the first spring into a retracted position within the casing,
- a bolt holdback that is configured to hold the locking bolt in the unlocked position in response to the user-operable mechanism moving the bolt into its unlocked position and to retain the bolt in the unlocked position when the force exerted by the user-operable mechanism is no longer applied, thereby leaving the lock unlocked and freely moveable away from the door frame and wherein the bolt holdback includes a first bolt engagement member that is urged by the trigger bar into engagement with the bolt when the trigger bar is in its projecting position, whereby said first bolt engagement member holds the locking bolt in the unlocked position while the trigger bar is in its projecting position and ceases to hold the bolt in the unlocked position when the trigger bar has been moved into the retracted position,

wherein the lock is configured to move the bolt to move into its locking position automatically when the trigger bar is moved into its retracted position,

3. A lock as in claim 2, wherein the holdback comprises an arm that moves with the trigger bar and that includes said first bolt engagement member that engages the bolt to keep the bolt in its unlocked position when the trigger bar is in its projecting position.

4. A lock as in claim 3, wherein the arm is configured to move the first bolt engagement member backwards and forwards in a direction opposite to the direction of movement of the trigger bar, e.g. it is pivoted and has a first end that engages the trigger

bar, a second end that moves the first bolt engagement member and a pivot located between the first end and the second end.

5. A lock as in any claim 3 or claim 4, which includes a second spring operating between the bolt and the arm, the arrangement being such that, when the trigger bar is moved into its retracted position, the movement of the arm tensions the spring to increase the force urging the bolt into its locking position and when the trigger bar is moved into its projecting position, the arm de-tensions the spring.

6. A lock as claimed in any one of claims 2 to 5, wherein said first spring exerts sufficient force on the arm that it is capable of urging the trigger bar outwards towards its projecting position whenever such movement of the trigger bar is not obstructed, e.g. by the strike plate.

7. A lock as claimed in any one of claims 2 to 6, wherein the bolt holdback comprises a second bolt engagement member, e.g. a hook, that engages with the bolt when the bolt is moved from its locking position into its unlocked position by the user-operated mechanism.

8. A lock as in claim 7, wherein the second bolt engagement member is released from engagement with the bolt when the trigger bar is moved into its projecting position.

9. A lock as claimed in claim 7 or claim 8, which is configured such that the second engagement member does not engage the bolt when the bolt is moved in response to the movement of the trigger bar between its extended and its retracted position whereby, if the lock is free of the strike plate and is pushed into its retracted position, the second engagement member does not hold back the bolt.

10. A lock as claimed in any one of claims 3 to 6, which includes a second bolt engagement member as claimed in any one of claims 7 to 9, wherein the arm controls the movement of the bolt and the second engagement member such that the second engagement member does not engage the bolt when the bolt is moved in response to the movement of the trigger bar between its extended and its retracted position.

11. A lock as claimed in any one of claims 3 to 6, which includes a second bolt engagement member as claimed in any one of claims 7 to 10, wherein the arm is configured such that, when the second engagement member holds back the bolt following the bolt being moved from its locking position into its unlocked position by the user-operated mechanism,

it moves the second bolt engagement member out of engagement with the bolt when the trigger bar is moved from its retracted position to its projecting position.

12. A lock as in any one of claims 2 to 11, which includes a deadlock that is configured to be moved into a deadlocking position when the bolt is in its locking position, thereby preventing the bolt from being moved towards its unlocked position by a force exerted on the bolt externally of the lock, and wherein the deadlock is configured to be moved out of its deadlocking position when the user-operable mechanism is operated to retract the bolt from its locking position to its unlocked position so that the deadlock does not block the bolt from being moved from the locking position to the unlocked position by the user operable mechanism.

12. A lock as claimed in any one of claims 7 to 11, which includes a deadlock as claimed in claim 12, wherein the deadlock and the second bolt engagement member are provided on a single part.

13. A lock as in any one of claims 2 to 12, wherein the user-operable member comprises:

- a nib that describes an arc when the user-operable member is operated and
- a lug that is movable by the nib along an arc that is concentric with, and extends beyond, the nib arc,

wherein the lug is capable of engaging the locking bolt and moving it from the locking position to the unlocked position.

14. A lock as in any one of claims 2 to 14, which includes a device that can be deployed manually to temporarily prevent said bolt from moving from its unlocked position to its locking position, wherein said device is only accessible for manual deployment when said lock is located away from said strike plate, e.g. it is accessible via the face of the lock that can lie adjacent to the strike plate.

15. A lock comprising:

- a casing,
- a bolt slidably mounted in said casing for movement between a locking position in which the bolt projects in a forward direction beyond said casing for insertion in a recess in a strike plate to lock the lock and a rearward unlocked position within said casing,
- a trigger bar capable of moving between a projecting position in which it projects out of said lock casing and a retracted position in which it

lies substantially within the casing, said trigger bar being spring biased by a first spring towards said projecting position,

- an arm that moves with said trigger bar and that engages the bolt to keep the bolt in its unlocked position when the trigger bar is in its projecting position, wherein the arrangement is configured such that movement of the trigger bar in a forwards or backwards direction moves the arm in a direction generally opposite to the direction of movement of the trigger bar, and
- a second spring acting between said arm and said bolt, whereby a backwards movement of said trigger bar towards its retracted position causes the arm to move forwardly to increase the tension in said second spring thus urging said bolt towards its locked position and whereby a forward movement of said trigger bar towards its projecting position causes the arm to move backwards and de-tension said second spring,

wherein said first spring exerts sufficient force on the arm that it is capable of urging the trigger bar outwards towards its projecting position whenever such movement of the trigger bar is not obstructed, e.g. by the strike plate, and wherein such forward movement of the trigger bar moves the arm backwards thereby de-tensioning the second spring and drawing it backwards thereby also moving the deadbolt backwards towards its unlocked position, which lock can optionally include the features of any preceding claim.

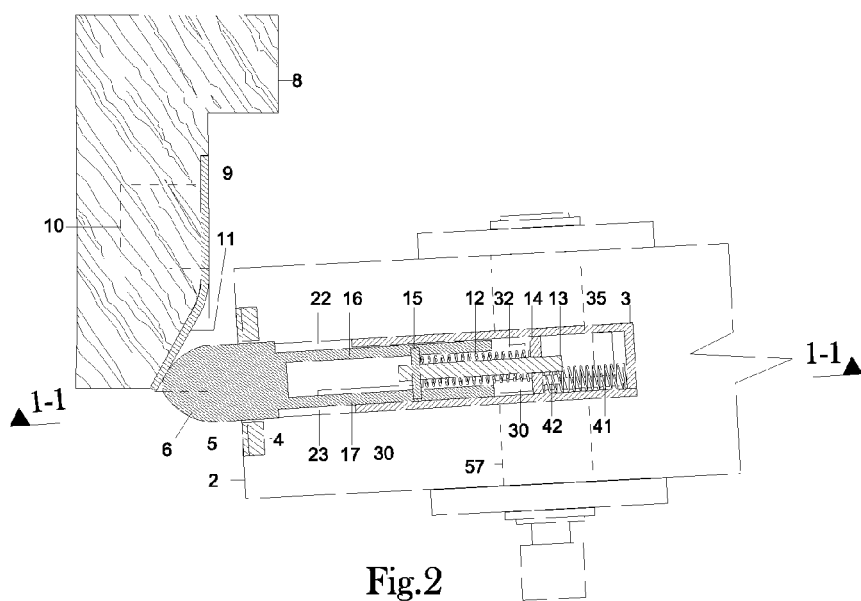
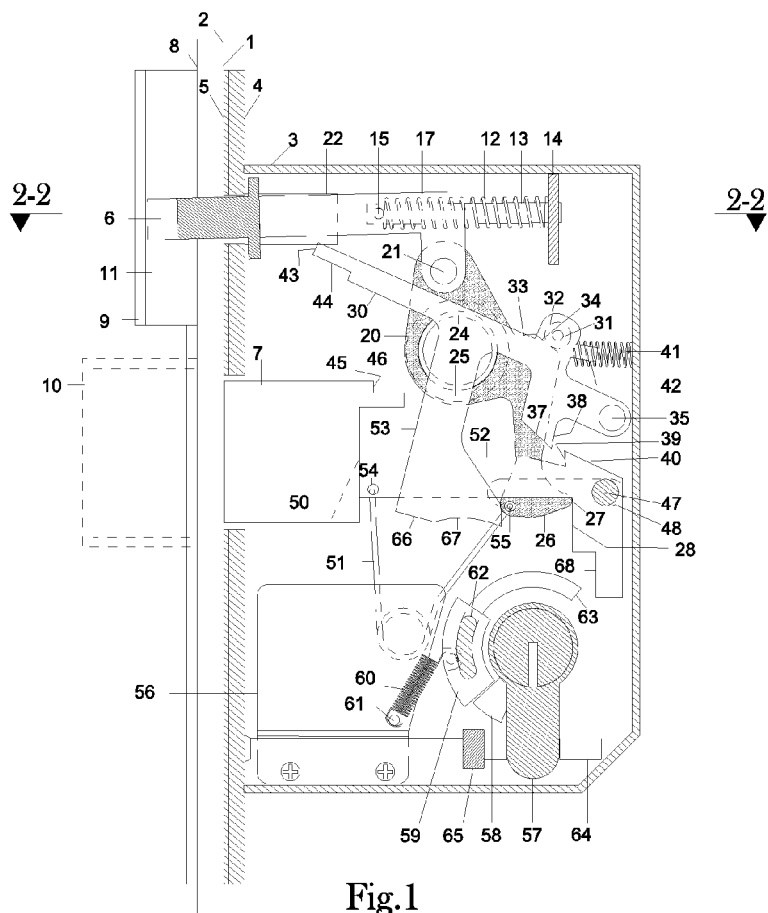
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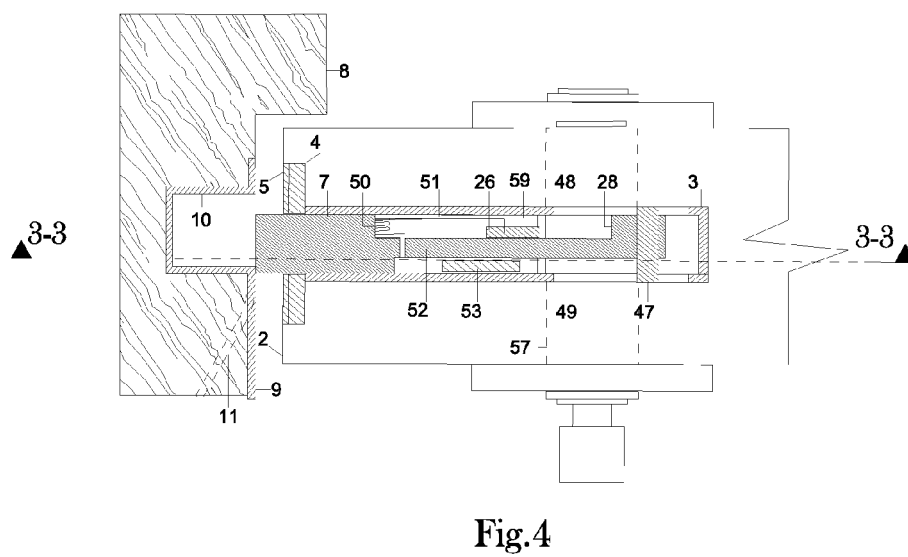
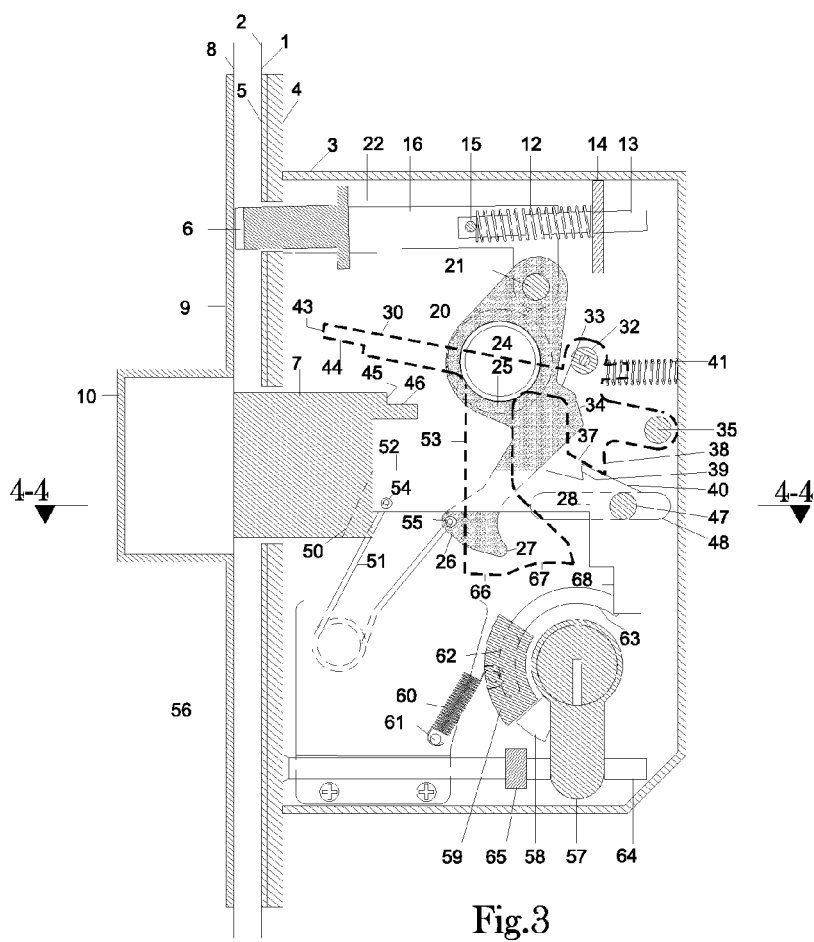
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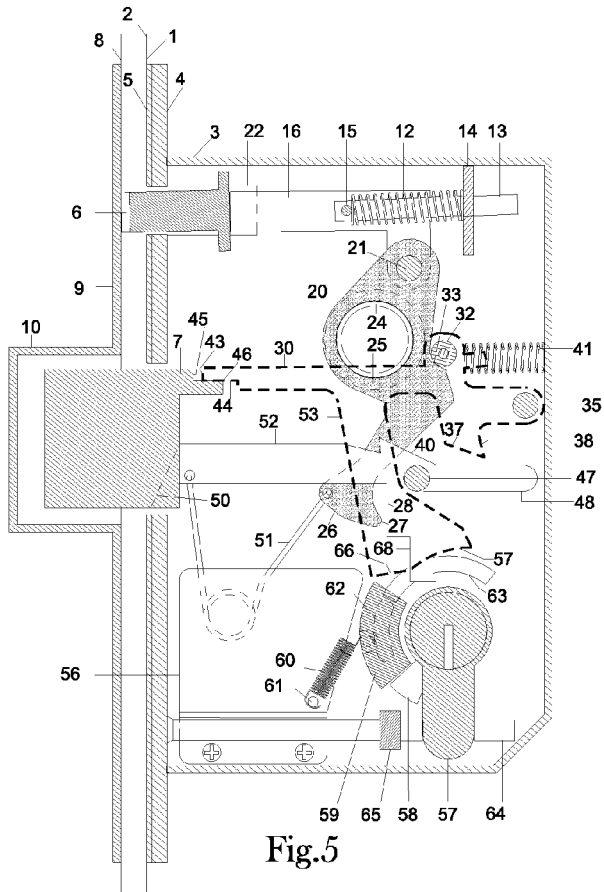


Fig.5

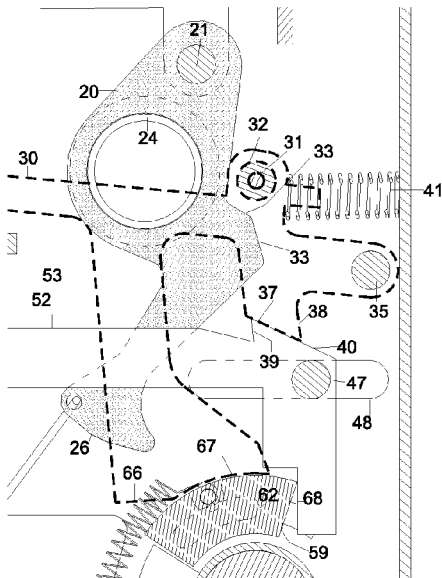


Fig.7

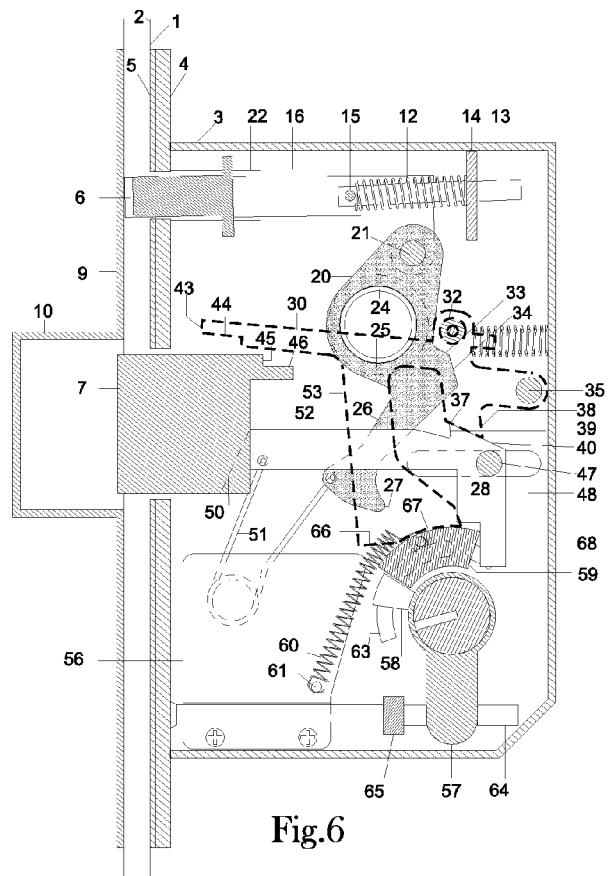


Fig.6

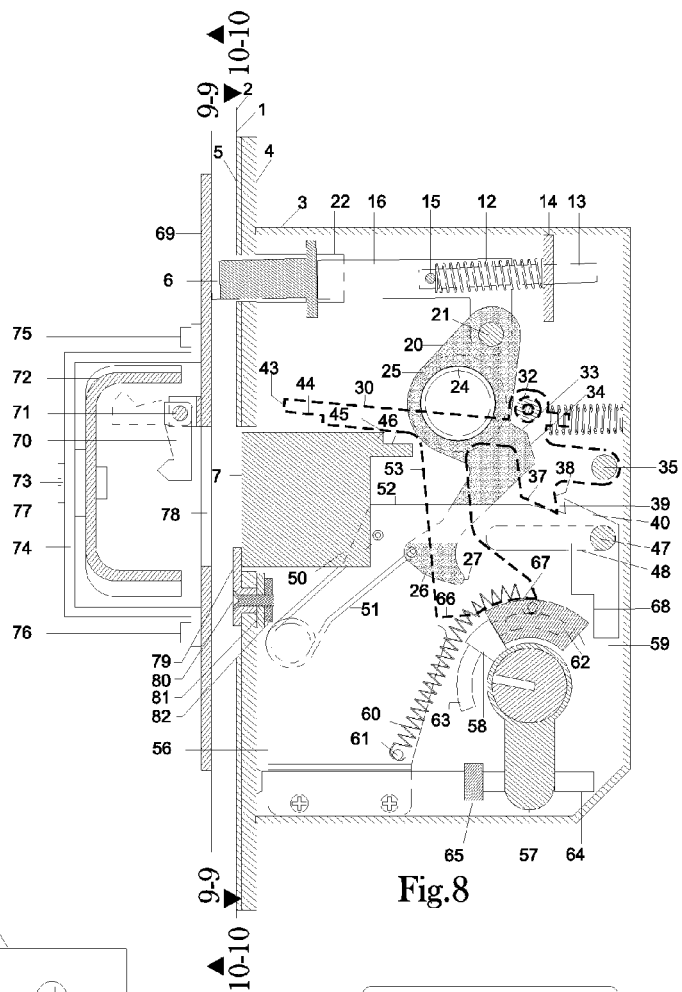


Fig.8

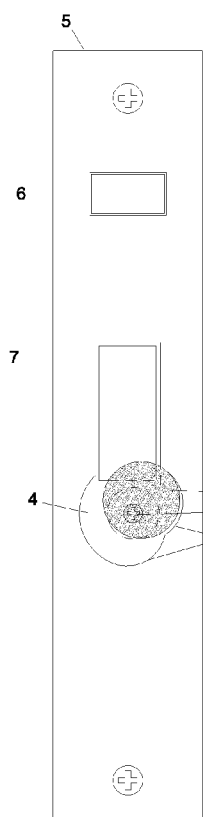


Fig.9

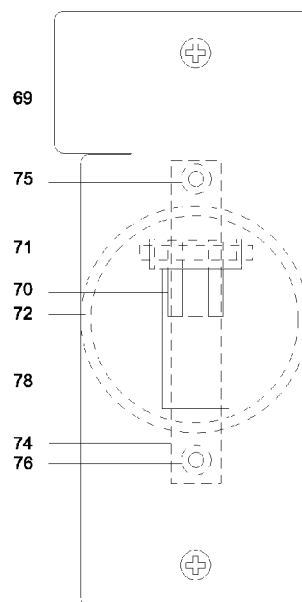


Fig.10

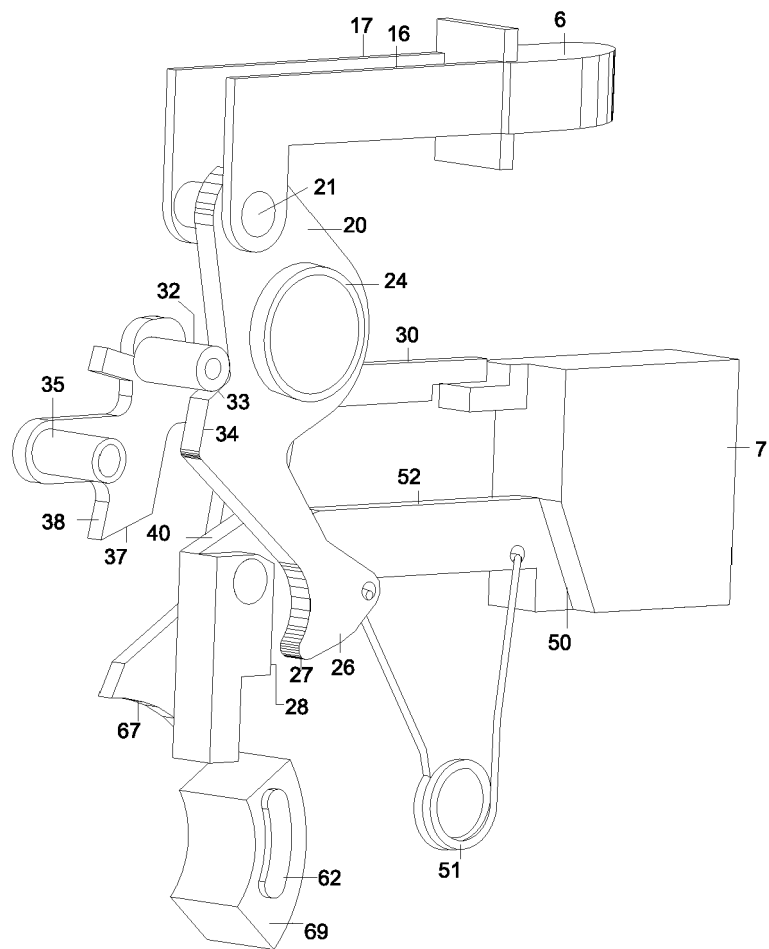


Fig.11



EUROPEAN SEARCH REPORT

 Application Number
 EP 13 17 5155

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2005/077735 A1 (GENEROWICZ PAUL [US] ET AL) 14 April 2005 (2005-04-14) * paragraph [0042] - paragraph [0046]; figures 1-4,16B *	1	INV. E05B17/20 E05B63/20 E05B45/02 E05B15/02 E05B17/00 E05B45/08 E05B55/12 E05B63/18
X	US 6 950 033 B1 (GUYRE LOUIS N [US]) 27 September 2005 (2005-09-27) * column 5, line 28 - line 31 * * column 14, line 18 - column 15, line 11; figures 1,3d,8,9 *	1	
X	EP 0 798 680 A1 (FUSS FRITZ GMBH & CO [DE]) 1 October 1997 (1997-10-01) * column 1, line 46 - line 53 * * column 3, line 23 - line 59; figure 1 *	1	
X	DE 203 07 824 U1 (PIORR MICHAEL [DE]; WILD ROBERT [DE]) 4 September 2003 (2003-09-04) * claims 1,2; figure 1 *	1	
A	DE 297 660 C (KARL STAHLCKER) 8 May 1917 (1917-05-08) * the whole document *	1	
A	US 1 695 077 A (ARNOLD ZUKOR ET AL) 11 December 1928 (1928-12-11) * the whole document *	1	TECHNICAL FIELDS SEARCHED (IPC) E05B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 6 February 2014	Examiner Ansel, Yannick
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)



Application Number

EP 13 17 5155

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 13 17 5155

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claim: 1

A strike plate with a sonic indicator for use with a lock.

2. claims: 2-15

A lock that locks automatically on closure of a door.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 17 5155

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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06-02-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		US 2010019513 A1	28-01-2010
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REFERENCES CITED IN THE DESCRIPTION

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- US 2519808 A [0003] [0017]
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