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(54) **Improvements in locks**

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Description

[0001] This invention relates to improvements in locks and is particularly concerned with means for increasing the throw or movement of the deadbolt of a lock.

[0002] The maximum longitudinal movement or "throw" of the bolt of a mortice lock is limited by the width of the lock casing. Where a lock is to be installed in a solid wooden door, for example, the width of the casing is relatively unimportant because there is no restriction on the depth of the recess in the door which is to accommodate the lock casing. However, in the case of a predominantly glass door with a surrounding frame of wood or plastics material, the maximum width of the lock casing must be less than the width of the door style. Typically, the styles of such doors have a width in the region of 100mm and the maximum overall width of lock casings which can be installed in such door styles is of the order of 75mm.

[0003] In order to be fitted in such a door style, the maximum distance from the outside front of the casing to the axis of a cylinder for the lock, is of the order of 57.0mm and the distance from the outside front of the lock forend to the said cylinder or lever key axis is commonly referred to as the backset. When such a lock is fitted with a deadbolt, the bolt is conventionally arranged to be driven by a cylinder cam or bolt thrower and, with a backset of only 57.0mm, the maximum bolt projection, i.e. the distance by which the bolt projects from the front of the forend when the bolt is thrown, that can normally be obtained by direct drive from a cylinder cam or bolt thrower is of the order of only 14mm. This distance is insufficient to provide a secure locking engagement in the framework surrounding the door. A similar problem is encountered with deadbolts for multi-detainer mortice locks.

[0004] The problem becomes increasingly acute with the use of new materials such as uPVC in which there is a substantial gap between the edge of the door and the surrounding frame. In order to meet the EU Standard, a throw of 20mm is required so that the head of the deadbolt projects into a striking plate in the frame for a distance which is sufficient to make the door secure.

[0005] A lock has been proposed in WO95/01491 having a dead lock assembly which comprises a bolt and a drive mechanism adapted to be operated by a key, wherein the drive mechanism comprises a driving link arranged to be driven by a lever actuated by the key and arranged in turn to drive the bolt, and a quadrant for transferring the drive from the driving link to the bolt in such a manner that the movement or throw of the bolt is increased relative to the displacement of the driving link.

[0006] While this prior arrangement can achieve the desired objective of increased bolt throw, the present invention aims to provide a mortice lock which is simpler to manufacture and yet still has an increased bolt projection or throw for a given width of lock casing in order to achieve a more secure engagement with the striking plate which is fitted to the door frame.

[0007] A lock has also been proposed in DE2525771 which has a deadbolt assembly comprising a bolt and a driving mechanism in the form of a rotatable cam which is operated by a key. A lever is pivotally mounted in the casing and is arranged to be engaged by the cam, when the bolt is driven by the cam from the unbolted to the bolted position, and to move the bolt so that additional movement is imparted to the bolt to increase its throw. The lever is mounted on a pin projecting from the bolt and thus some part of the lever projects from the casing when the bolt is in the unbolted position. This is a serious disadvantage and makes this arrangement quite unsuitable for a high security lock.

[0008] The present invention aims to provide a lock which overcomes this disadvantage.

[0009] According to the invention, there is provided a lock for a door or the like having a casing and a deadbolt assembly which comprises a bolt and a drive mechanism comprising a rotatable cam which is adapted to be operated by a key, wherein a lever is arranged between the drive mechanism and the bolt and is so arranged that, when the lever is acted on by the drive mechanism to move the bolt from an unbolted to a bolted position, the configuration of the lever is such that additional movement is imparted to the bolt to increase its throw, the lever being pivotally mounted on a pin which is mounted in the casing and the lever being arranged to be engaged by the cam during rotation of the latter in order to move the bolt to the bolted position, the lever pivoting about the pin and increasing the lateral movement or throw of the bolt, the lever being so arranged that it plays no part in moving the bolt from the bolted to the unbolted position, characterised in that the lever engages a surface of the bolt when moving the bolt to the bolted position and in that the lever is located wholly within the casing in both the bolted and unbolted positions of the bolt.

[0010] The invention will now be described in detail, by way of example, with reference to the drawings, in which:-

Fig. 1 is an exploded perspective view of one embodiment of a five detainer mortice lock according to the invention;

Fig. 2 is a side elevation of the lock shown in Fig. 1 showing the lock in the unlocked condition and with only one of the detainers illustrated;

Figs. 3 and 4 are side elevations of the lock shown in Fig. 2 but showing the component parts of the lock during movement from the unlocked to the locked condition;

Fig. 5 is a schematic view illustrating the dimensional results of the changing geometry of the bolt

mechanism as it is moved from the unlocked to the locked position;

Figs. 6 and 7 are side elevations of the lock shown in Figs. 2 to 4 but showing further stages in the locking sequence;

Fig. 8 is a side elevation of the lock shown in Figs. 2 to 4 but showing the component parts of the lock in the locked condition;

Figs. 9 to 12 are side elevations of the lock shown in Fig. 2 but showing various stages during the unlocking sequence;

Fig. 13 is an exploded perspective view of one embodiment of a cylinder operated lock according to the invention;

Fig. 14 is a side elevation of the lock shown in Fig. 13 in the unlocked condition;

Figs. 15 to 17 are side elevations of the lock shown in Fig. 14 but showing the component parts of the lock during movement from the unlocked to the locked condition;

Fig. 18 is a side elevation of the lock shown in Figs. 13 to 17 but showing the lock in the locked condition;

Fig. 19 is a side elevation, corresponding to Fig. 18, but showing further movement of the operating cam; and

Figs. 20 to 22 show various operating sequences of a latch bolt forming part of the lock according to the invention.

[0011] In the drawings, like parts are denoted by like reference numerals.

[0012] Reference will first be made to Figs. 1 to 8 of the drawings in which a lock according to the invention comprises a casing 1 to one side of which is mounted an inner forend 3 and an outer forend 4 (not shown in Fig. 1). The casing is arranged to be closed by a cover plate 2. A latch bolt assembly is reciprocally mounted in the casing and comprises a latch bolt head 5 secured to a latch bolt lath 6 by screws 7 which engage in screw-threaded bores 6a in the bolt lath 6. The latch bolt head 5 is urged by a spring 8 to project through an aperture 4a in the forends 3, 4 under normal conditions, the spring bearing at one end on a wall 6a of the lath 6 and at the other end against a side wall 1a of the casing 1. The spring 8 is held in position by engaging pegs 9a and 9b fixed, respectively, to the wall 6a of the lath 6 and the side wall 1a of the casing 1 and engaging in the respective ends of the spring 8. The lath 6 is guided for sliding movement in the casing 1 by a pin 10 which is fixed to the casing and extends through an elongated aperture 6b in the lath 6. The arm 11a of a follower 11 is located between the pin 10 and the wall 6a of the lath 6, the follower being mounted on a square-sectioned spindle (not shown) extending through the casing and having a handle (not shown) fixed to at least one of its ends. The follower arm 11a is provided with a peg 11b for locating one end of a spring 12 the other end of which bears against the casing wall 1a and is located there by a peg 13 which is fixed to said casing wall. A spacer 14 serves to locate the follower 11 in the casing 1. Turning a handle is effective to rotate the spindle and hence the follower 11 against the action of the spring 12. Turning of the follower 11 causes the follower arm 11a to move the lath 6, against the action of the spring 8, and the lath moves along the pin 10 to retract the bolt head 5 into the casing 1. If the handle is now released, the springs 8 and 12 re-exert themselves, and force the bolt head 5 once more to project from the forends 3 and 4.

[0013] The lock shown in Figs. 1-12 of the drawings further comprises a deadbolt assembly including a deadbolt 15. The deadbolt 15 is provided with a stump 16 which is located in an elongated slot 2a in the cover plate 2 for guiding movement of the deadbolt 15. A pin 17 projects from the other side of the deadbolt 15 and is located in an elongated slot 1b in the casing 1, again for guiding movement of the deadbolt. A plurality of detainers 24 and spacers 27 are pivotally mounted on a pin 26 which is fixed in the casing, each detainer and spacer having an openended slot 24a through which the stump 16 extends. Leaf springs 25 fixed to each of the detainers 24 are engaged with a pin 19 in the casing 1, said springs serving to force the respective detainers into a position in which the stump 16 is engaged in respective notches 24b in each of the slots 24a in the unlocked position of the deadbolt assembly as shown in Fig. 2 of the drawings. A bolt throw extension lever 18 is pivotally mounted on the pin 19 for a purpose to be hereinafter described.

[0014] Aligned keyhole slots 1c and 2c are provided in the casing 1 and cover plate 2 respectively and a bolt thrower 20 is rotatably mounted in the circular parts of the slots 1c and 2c. A cam controller 21 is pivotally mounted on a pin 23 in the casing 1 and is arranged to be acted on by a spring 22 which is mounted on a pin 28 in the casing. The spring 22 urges the cam controller 21 into engagement with the bolt thrower 20 so that the bolt thrower engages in a notch 21a in the cam controller whereby the bolt thrower is held in position in the unlocked condition of the lock as shown in Fig. 2 of the drawings. Also as shown in this figure, the deadbolt 15 is fully withdrawn in the unlocked condition of the lock.

[0015] If it is desired to move the deadbolt 15 to the locked position, a key (not shown) must first be inserted into the bolt thrower 20 through one of the keyhole slots 1c or 2c. Rotation of the bolt thrower 20 in the counter-clockwise direction as indicated by the curved arrow in

Fig. 2 initially causes the cam controller 21 to pivot about the pin 23, against the action of the spring 22, so that the bolt thrower 20 moves out of its engagement in the notch 21a. Further rotation of the bolt thrower will bring the key into engagement with radiussed edges 24c of the detainers 24 whereby the detainers are compelled to pivot clockwise about the pin 26, as indicated by the curved arrow in Fig. 3, to a position in which the notches 24b are moved clear of the stump 16 and the stump is aligned with the slots 24a. Each detainer then dwells with its specific radius 24c bearing on the appropriate step or lift on the key thus maintaining the alignment of the stump 16 in the slots 24a while the key is rotated. At the same time, the bolt thrower 20 is moved into a notch 15d in the deadbolt 15.

[0016] The leading face 20a of the bolt thrower 20 now comes into contact with an edge 18a of the extension lever 18 as shown in Fig. 3 of the drawings. As shown in Fig. 4, further counter-clockwise rotation of the bolt thrower 20 causes the extension lever 18 to pivot about the pin 19 and its face 18b to press against a shoulder 16a on the deadbolt 15 thus forcing the deadbolt to the left as shown in Fig. 4. The deadbolt is guided in its linear motion by the engagement of the pin 17 in the slot 1b in the casing 1. This engagement also limits the travel of the deadbolt in both directions. Further linear guidance is provided where the head section 15a of the deadbolt is engaged in apertures in the forend plates 3 and 4. Fig. 6 shows the continuation of this operation where the motion from the bolt thrower 20 is transmitted through the extension lever 18 to the deadbolt 15 which is urged to the left as shown in the drawings.

[0017] As can be seen from Fig. 5, the extension lever 18 is so located that as it is driven at its edge 18a by the face 20a of the bolt thrower 20, as the latter rotates, an effective straight line "throw" of 17mm is generated by the arcuate path of the edge 18a as it is propelled across the sweep of the rotating bolt thrower 20. However, the effective straight line dimension between the edges 18a and 18b at the commencement of the action in the unlocked position is 11mm but since the angular relationship between the points of contact at 18a and 18b changes as the extension lever pivots on the pin 19, in the fully thrown i.e. locked condition, the effective dimension between the edges 18a and 18b becomes 14mm. This increase of 3mm when added to the 17mm already provided by the extension lever 18 results in 20mm of motion being imparted to the deadbolt.

[0018] In Fig. 7, the deadbolt 15 has arrived at its fully thrown position, having moved through the required 20mm, and is held stationary in this position since the extension lever 18 is obliged to dwell with its edge 18a bearing on the radiussed face 20b of the bolt thrower 20 while the latter continues to rotate, counter-clockwise. This further rotation now allows the detainers 24 urged by their respective springs 25 and released from the lifting steps on the key, to pivot counter-clockwise on the pin 26. The stump or detent block 16 being fixed to the deadbolt 15 has also moved through 20mm so that it is now clear of the radiussed edges 24c of the detainers 24 so the detainers are free to pivot, counter-clockwise urged by their springs 25, to the level where their edges 24d come to rest on the detent block or "stump" 1b and thus the deadbolt is fully arrested in the locked position. In this situation, the extension lever 18 is held in its correct alignment by the engagement of a notch 18c with the detent block 16. The guide pin 17 being fixed to the deadbolt has reached the limit of its travel in the slot 1b in the casing, thus preventing any further leftward movement of the deadbolt.

[0019] Fig. 8 shows the unit in the locked condition with the bolt thrower 20 now having rotated to its full counter-clockwise extent, limited by its shoulder 20c engaging the edge 15b of the deadbolt 15 with the key exit/entry slot being in alignment with the corresponding slots 1c and 2c in the casing 1 and cover plate 2. This alignment is maintained against inadvertent clockwise rotation by the cam controller 21. Urged by the spring 22 the recess 21 in the cam controller engages the face 20b of the bolt thrower 20, thus completing the sequence.

[0020] In order to unlock the deadbolt, a key must be inserted in the bolt thrower 20 and the bolt thrower turned, by means of the key, in a clockwise direction as viewed in the drawings. Turning of the bolt thrower will disengage the shoulder 20c from the edge 15b of the deadbolt as well as the face 20b of the bolt thrower from the notch 21a in the cam controller 21. Further rotation of the bolt thrower in a clockwise direction as indicated by the curved arrow in Fig. 9 will cause the flank of the key to press against the detainers 24. The detainers are forced to pivot in a clockwise direction about the pin 26 until the steps on the key engage the respective detainers 24 at their specifically radiussed edges 24c and cause further pivoting of the detainers about the pivot pin 26 until the gate slots 24a are aligned with the detent block or stump 16 as shown in Fig. 10 of the drawings. The deadbolt is thus no longer detained and at the same time the face 20d of the bolt thrower 20 is moved into engagement with an angled face 15c of the deadbolt 15.

[0021] Further rotation of the bolt thrower will cause the deadbolt to be moved to the right as viewed in the drawings. In this case, the deadbolt is driven directly by the bolt thrower instead of by the extension lever as in the locking sequence and the extension lever 18 is now controlled by the deadbolt at the engaging faces 18b and 16a respectively so that the extension lever 18 is pivoted in a counter-clockwise direction about the pin 19 as indicated in Fig. 11 of the drawings as the deadbolt is withdrawn.

[0022] Fig. 12 shows the deadbolt 15 in the fully withdrawn position with the angled face 15c on the deadbolt engaging the radiussed face 20b of the bolt thrower 20 and, since the guide pin 17 on the deadbolt has reached the limit of the slot 16 in the casing, the deadbolt is held in this position while the bolt thrower continues to rotate

in a clockwise direction. The detainers 24 are released from the lifting steps of the key and, under the action of the springs 25, they pivot in a counter-clockwise direction until the notches 24b in the slots 24a engage with the detent block or stump 16 thus holding the deadbolt in its fully withdrawn or unlocked position.

[0023] Further clockwise rotation of the bolt thrower returns it to the position shown in Fig. 2 in which it is aligned with the key exit/entry slots 1c, 2c in the casing and cover plate respectively and the radiussed face 20b of the bolt thrower is engaged in the notch 21a in the cam controller 21, against the action of the spring 22, to impede any inadvertent clockwise rotation thereby completing the sequence. Inappropriate counter-clockwise rotation of the bolt thrower is prevented by the shoulder 20e on the bolt thrower engaging a radiussed tip 18d of the extension lever as shown in Fig. 2.

[0024] Turning now to Figs. 13 and 14 of the drawings, the cylinder operated lock shown in these figures differs from the lock shown in Figs. 1 to 12 in that the deadbolt 15 is replaced by a deadbolt assembly comprising a deadbolt head 35a and a deadbolt lath 35b. A pin 37 is secured to the deadbolt lath 35b and is located in a slot 1d in the casing 1. An extension lever 38 is pivotally mounted on a pivot pin 39 which is fixed in the casing 1. At its opposite extremity the arcuate path of an edge 38a of the extension lever overlaps the sweep of the operating arm or "cam" 40a of a conventional pin-tumbler cylinder unit 40. The cam 40a has the same effect as the bolt thrower 20 in the detainer version, in that when throwing the deadbolt from the unlocked to the locked position the cam 40a acts against the edge 38a of the extension lever 38 and an edge 38b of the extension lever acts against a shoulder 36a on the deadbolt head 35a. Thus, as the cam 40a of the cylinder is rotated further counter-clockwise, as viewed in Fig. 14, the extension lever is obliged to pivot further clockwise and the changing geometry between all the points of contact delivers the required increased amount of leftward travel to the deadbolt, just as in the detainer version. Also common with the detainer version, in this cylinder operated version the deadbolt is only driven by the extension lever 38 in the action from the unlocked to the locked position, being then returned to the unlocked position by the clockwise rotation of the cylinder cam, as with the bolt thrower in the multi detainer version. The cylinder 40 is retained in the casing by a screw 40h which passes through a bore 40c in a side wall 1e of the casing 1 and through an apertured guide 40e and is engaged in a screw-threaded bore 40g in the cylinder 40. The guide 40e is provided with side extensions 40f which engage, respectively, in slots 1f and 2f in the casing 1 and cover plate 2.

[0025] The deadbolt assembly again incorporates a detent block or "stump" 36 but since the "differing" of the system is now a function of the pin-tumbler mechanism, only a single detainer 44 is needed in order to arrest the deadbolt at each end of its travel. The detainer 44 is pivotally mounted on a pivot pin 46 which is fixed in the casing, a spacer 47 being located between the deadbolt lath 35b and the detainer 44 and the spacer being similarly pivotally mounted on the pivot pin 46. A spring 45 acts on the detainer 44 urging it in a counter-clockwise direction so that the detent block or stump 36 engages in a notch 44b in the detainer 44 in the unlocked position of the deadbolt as shown in Fig. 14. One end of the spring 45 is secured in the detainer 44 and the other end bears against a pin 45a which is mounted in the casing 1. The spacer 47 is provided with a slot 47a to accommodate the detent block or stump 36 but in this case no notch is provided in the spacer.

[0026] As the cam 40a is rotated counter-clockwise in order to move the deadbolt assembly as indicated by the curved arrow in Fig. 15, it is moved into a notch 35d in the deadbolt lath 35b and bears against the detainer 44 which is thus caused to pivot in a clockwise direction to the level at which a slot 44a is aligned with the stump or detent block 36 on the deadbolt lath 35b. Once this alignment is reached, the cam 40a passes on to a specifically radiussed edge 44c of the detainer 44 so that the alignment is maintained while the deadbolt is travelling as indicated in Figs. 15 to 17 of the drawings.

[0027] When the deadbolt is fully thrown to the locked position indicated in Fig. 18, further counter-clockwise rotation of the cylinder 40 takes the cam 40a to the position where it no longer bears on the radiussed edge 44c of the detainer 44 thus allowing the latter to pivot counter-clockwise, urged by the spring 45 while the deadbolt assembly is held stationary by the dwell which occurs when the edge 38a of the extension lever 38 is engaged by a radiussed edge 40b of the cam 40a and the guide pin 37 fixed in the deadbolt lath 35b reaches the limit of the slot 1d in the casing 1. At the same time, since the cam 40a has been moved clear of the radiussed edge 44c of the detainer 44, the spring 45 is effective to urge the detainer in a counter-clockwise direction so that an edge 44d of the detainer engages behind the stump 36 as shown in Fig. 18 of the drawings. In this position, a projection 44e on the detainer 44 lies inside the circular path or "sweep" of the cylinder cam 40a in order to limit the counter-clockwise rotation of the cam 40 as indicated by the dotted lines in Fig. 19, and thus prevents the detainer from being lifted inappropriately.

[0028] In order to withdraw the deadbolt to the unlocked position, the cylinder cam 40a must be rotated by a key in the cylinder 40 in the clockwise direction. In this case, the radiussed edge 40b of the cylinder cam 40a will engage the radiussed edge 44c of the detainer 44 to lift the detainer so that its edge 44d is raised clear of the stump 36. Further rotation of the cam 40a will cause it to engage an angled face 36b of the deadbolt lath 35b and cause the deadbolt assembly to be withdrawn since the stump 36 is now aligned with the slot 44a in the detainer 44. The cam 40a continues to move the deadbolt assembly to the right until the cam comes into engagement with the side of the detainer projection

44e. At this point, the stump 36 is aligned with the notch 44b in the detainer slot 44a. Further rotation of the cam 40a causes the detainer to pivot in a counter-clockwise direction, assisted by the spring 45, until the cam is moved clear of the end of the detainer projection 44e. The engagement of the stump 36 in the notch 44b is however so arranged that the detainer projection 44e is now located out of the path of the cam 40a as indicated in Fig. 14 of the drawings.

[0029] The cam must be returned to the position shown in Fig. 14 before the key can be removed from the cylinder lock 40. However, if the key is not removed, the cylinder cam 40a may be rotated further in a clockwise direction in order to operate a cylinder-to-latchbolt linking mechanism.

[0030] As shown in Fig. 13, the spacer 14 of the detainer version is replaced by an outer follower 34 having an upper projecting arm 34a and a link 34b which is provided at its end with a bore adapted to receive a pivot pin 54. The follower 34 is mounted on the follower 11 but in this case the follower 34 has an arcuate cut-out 34c which engages over a projection 11c on the follower 11 which limits pivotal movement of the follower 34 with respect to the follower 11. In the position shown in Fig. 20 of the drawings, the projection 11c engages the upper end of the arcuate cut-out 34c.

[0031] A cylinder-to-latch link 55 is pivotally mounted on the pivot pin 54 and is provided at its lower end with a cranked portion 55a which is located in the path of the cylinder cam 40a in the unbolted position of the deadbolt. If the cylinder cam 40a is rotated further in a clockwise direction from the position in which the deadbolt assembly is fully withdrawn as shown in Fig. 14 to the position shown in Fig. 20, the cam comes into engagement with the portion 55a of the link 55. The link is located in a recessed area 35c of the deadbolt head 35a and is forced in an upwards direction by the engagement of its portion 55a by the cam 40a. The upwards movement of the link 55 causes the follower 34 to rotate in a clockwise-direction, by virtue of the connection to the link by the pivot pin 54, which causes the arm 34a to move the lath 6 to the right to retract the latch bolt head 5 as shown in Fig. 21 of the drawings. In this position, the follower 34 has been moved with respect to the follower 11 so that the lower end of the arcuate cut-out 34c now engages the other side of the projection 11c.

[0032] Once the latch bolt head 5 has been withdrawn and a door fitted with the lock has been opened, the cam 40a can be returned to the vertical position shown in Fig. 14 and the key withdrawn. The spring 8 will act on the follower arm 34a to return it to the position shown in Fig. 20 of the drawings and the link 55 will also be returned by virtue of its connection to the outer follower 34 by the pivot pin 54.

[0033] The arrangement is such that, if the deadbolt has been thrown to the locked position, the cylinder-to-latch linkage does not operate. The link 55 is provided with a projection 55b which lies across the path of the stump or detent block 36 so that as the deadbolt is thrown to the locked position, the stump or detent block 36 engages the projection 55b to move the link 55 out of the path of the cylinder cam 40a as shown in Fig. 22 of the drawings, the link pivoting about the pivot pin 54. Thus rotation of the cam 40a has no effect on the link 55 or on the latch bolt.

[0034] Conversely, as the deadbolt is withdrawn to the unlocked position, the deadbolt engages the link 55 to return it to the position shown in Fig. 20 in which the projection 55a is located in the path of the cylinder cam 40a.

[0035] The compression spring 12 acts only against the arm 11a of the latchbolt follower 11 to return the motion from the external handles via the square spindle. Since the function of the two springs 8 and 12 are partly independent the result is that the latchbolt head and the cylinder-to-latch action can be lightly sprung while the external handles/latch action may be sprung more heavily. The compression spring 8 acts against the latchbolt lath 6 at its face 6a so as to return the assembly to the latched position when the manual force from the key/cylinder is released. Similarly, if a door fitted with a lock according to the invention is pushed shut, only the force of the spring 8 needs to be overcome by the movement of the latch bolt head 5 as the door is shut. The pin 10, which is fixed in the casing, serves not only to guide the linear motion of the latchbolt assembly and to limit its travel but also functions as a limiting position for the arms 11a and 34a of the followers 11 and 34 respectively in the latched situation where they bear against the pin 10 under the action of the springs 8 and 12.

[0036] In order that the locks according to the invention may be utilised in both left-hand and right-hand opening doors, the latch bolt head 5 may be reversed in either or both of the above-described embodiments. In order to reverse the bolt head 5, it is merely necessary to undo the screws 7 to release the bolt head from the lath 6 and to turn over the bolt head. The bolt head is provided with bores 5a on both sides to accommodate the screws 7 for this purpose. Apertures 2b in the cover plate 2 allow access to the screws 7 from outside the lock so that the casing does not have to be opened in order to reverse the bolt head.

[0037] The above-described mechanism is intended mainly for use in the established sizes of mortice lock casings but may be utilised in various other situations. As will be seen from the foregoing, the extension lever which enables the increased throw of the deadbolt can be used both for multi-lever detainer locks as well as with cylinder operated locks with only minor dimensional changes. Further only one additional part, namely the extension lever, is required than with most conventional locks.

[0038] The invention is not restricted to the above-described embodiments but modification and variations may be made without departing from the scope of the invention as claimed in the claims.

Claims

1. A lock for a door or the like having a casing (1) and a deadbolt assembly which comprises a bolt (15,35a) and a drive mechanism comprising a rotatable cam (20a,40a) which is adapted to be operated by a key, wherein a lever (18,38) is arranged between the drive mechanism and the bolt (15,35a) and is so arranged that, when the lever is acted on by the drive mechanism to move the bolt from an unbolted to a bolted position, the configuration of the lever is such that additional movement is imparted to the bolt to increase its throw, the lever (18,38) being pivotally mounted on a pin (19,39) which is mounted in the casing (1) and the lever (18,38) being arranged to be engaged by the cam during rotation of the latter in order to move the bolt to the bolted position, the lever pivoting about the pin (19,39) and increasing the lateral movement or throw of the bolt, the lever being so arranged that it plays no part in moving the bolt from the bolted to the unbolted position, **characterised in that** the lever engages a surface of the bolt when moving the bolt to the bolted position and **in that** the lever is located wholly within the casing in both the bolted and unbolted positions of the bolt.

2. A lock according to claim 1, **characterized in that** the lever is so configured that when it is engaged by the cam during rotation of the latter and engages the said surface of the bolt to move the bolt to the bolted position, its pivotal movement is such that it increases the lateral movement or throw of the bolt by at least 3mm

3. A lock according to claim 1 or claim 2, **characterized in that** the lock comprises a mortice lock having a plurality of detainers (24) for immobilising the bolt in either of its bolted or unbolted positions, the detainers being pivotally mounted on a pin (26) which is mounted in the casing and each detainer having a first notch (24b) which is engageable with a projection (16) on the bolt (15) to retain the bolt in its unbolted position and a second notch (24d) engageable with the bolt to retain said bolt in its bolted position, and **in that** the cam is provided on a bolt thrower (20) and is engageable in a notch (15d) in the bolt (15) in order to move the bolt from the unbolted to the bolted position, rotation of the cam initially moving the detainers (24) to a position in which the first notches (24b) are out of engagement with the projection (16) on the bolt to permit said bolt to be moved towards the bolted position, and when the bolt has been moved to the bolted position, the projection being so positioned that it can engage the second notches in the detainers, the detainers being urged into engagement with the cam and with the projection on the bolt by respective springs (25).

4. A lock according to claim 3, **characterized in that** means are provided for immobilising the cam in both the bolted and unbolted positions of the bolt, said cam immobilising means preferably comprising a spring loaded lever (21) which is pivotally mounted in the casing (1), said lever having a notch (21a) in which the cam (20a) is engageable.

5. A lock according to claim 1 or claim 2, **characterized in that** the lock comprises a cylinder lock incorporating the said cam (40a) and **in that** the lock includes a detainer (44) which is pivotally mounted in the casing, the detainer having a first notch (44b) which is engageable with a projection (36) on the bolt to retain the bolt in its unbolted position and a second notch (44d) engageable with the bolt to retain said bolt in its bolted position, and **in that** the cam (40a) is engageable in a notch in the bolt (35) in order to move the bolt from the unbolted to the bolted position, rotation of the cam initially moving the detainer to a position in which the first notch is out of engagement with the projection on the bolt to permit said bolt to be moved towards the bolted position and, when the bolt has been moved to the bolted position, the projection being in a position in which it can engage the second notch in the detainer, the detainer being urged into engagement with the cam and with the projection on the bolt by a spring (45).

6. A lock according to claim 5, **characterized in that** the lock further includes a latch (5) and a cylinder-to-latch assembly, the arrangement being such that, if the cylinder (40) is operated to cause the cam (40a) to rotate to withdraw the bolt (35) from the bolted position, further rotation of the cam is effective, via said cylinder-to-latch assembly, to retract the latch (5).

7. A lock according to claim 6, **characterized in that** means are provided to move the cylinder-to-latch assembly out of engagement with the cam when the bolt is moved to the bolted position.

8. A lock according to claim 6, **characterized in that** the cylinder-to-latch assembly includes a lever (55) which is pivotally connected at one end to a latch assembly and which is provided, at its other end, with a projection (55a) which is engageable by the cam (40a), the lever (55) preferably having a further projection which is arranged to be engaged by the projection (36) on the bolt (35), when said bolt is moved to the bolted position, to move the projection (55a) at the said other end of the lever out of the path of movement of the cam.

Patentansprüche

1. Schloß für eine Tür oder dergleichen mit einem Gehäuse (1) und einer Schubriegeleinheit, welche einen Antriebsmechanismus mit einer drehbaren Nocke (20a, 40a) umfaßt, welche so ausgebildet ist, daß sie durch einen Schlüssel betätigt werden kann, wobei ein Hebel (18, 38) zwischen dem Antriebsmechanismus und dem Riegel (15, 35a) angeordnet ist und so angeordnet ist, daß, wenn der Antriebsmechanismus so auf den Hebel wirkt, daß dieser den Riegel aus einer entriegelten in eine verriegelte Position bewegt, die Konfiguration des Hebels derart ist, daß dem Riegel eine zusätzliche Bewegung verliehen wird, um seinen Wurf zu vergrößern, wobei der Hebel (18, 38) auf einem Stift (19, 39), welcher in dem Gehäuse (1) angebracht ist, schwenkbar angebracht ist und der Hebel (18, 38) so angeordnet ist, daß dieser durch die Nocke während einer Drehung derselben berührt wird, um den Riegel aus der verriegelten Position zu bewegen, wobei der Hebel um den Stift (19, 39) schwenkt und die seitliche Bewegung bzw. den Wurf des Riegels vergrößert, wobei der Hebel so angeordnet ist, daß dieser keinen Anteil am Bewegen des Riegels aus der verriegelten in die entriegelte Position hat, **dadurch gekennzeichnet, daß** der Hebel an eine Oberfläche des Riegels angreift, wenn sich der Riegel aus der verriegelten Position bewegt, und daß der Hebel sowohl in der verriegelten als auch in der entriegelten Position des Riegels vollständig innerhalb des Gehäuses liegt.

2. Schloß nach Anspruch 1, **dadurch gekennzeichnet, daß** der Hebel so konfiguriert ist, daß, wenn dieser von der Nocke während einer Drehung derselben berührt wird und an die Oberfläche des Riegels angreift, um den Riegel in die verriegelte Position zu bewegen, seine Schwenkbewegung derart ist, daß diese die seitliche Bewegung bzw. den Wurf des Riegels um wenigstens 3 mm vergrößert.

3. Schloß nach Anspruch 1 oder Anspruch 2, **dadurch gekennzeichnet, daß** das Schloß ein Einsteckschloß mit einer Mehrzahl von Zuhaltungen (24) zum Immobilisieren des Riegels in entweder seiner verriegelten oder entriegelten Position umfaßt, wobei die Zuhaltungen auf einem Stift (26), welcher in dem Gehäuse angebracht ist, schwenkbar angebracht sind und jede Zuhaltung eine erste Raste (24b) aufweist, welche mit einem Vorsprung (16) auf dem Riegel (15) in Eingriff gebracht werden kann, um den Riegel in seiner entriegelten Position zu halten, und eine zweite Raste (24d) mit dem Riegel in Eingriff gebracht werden kann, um den Riegel in seiner verriegelten Position zu halten, und daß die Nocke auf einem Riegelwerfer (20) vorgesehen ist und in eine Raste (15d) in dem Riegel (15) in Eingriff gebracht werden kann, um den Riegel aus der entriegelten in die verriegelte Position zu bewegen, wobei eine Drehung der Nocke die Zuhaltungen (24) anfänglich in eine Position bewegen, in welcher die ersten Rasten (24b) außer Eingriff mit dem Vorsprung (16) auf dem Riegel liegen, um dem Riegel zu erlauben, in Richtung der verriegelten Position bewegt zu werden, und, wenn der Riegel in die verriegelte Position bewegt worden ist, der Vorsprung so positioniert ist, daß dieser in die zweiten Rasten in den Zuhaltungen eingreifen kann, wobei die Zuhaltungen durch jeweilige Federn (25) in Eingriff mit der Nocke und mit dem Vorsprung auf den Riegel gezwungen werden.

4. Schloß nach Anspruch 3, **dadurch gekennzeichnet, daß** Mittel zum Immobilisieren der Nocke sowohl in der verriegelten als auch in der entriegelten Position des Riegels vorgesehen sind, wobei die Nocken-Immobilisierungsmittel vorzugsweise einen federbelastenen Hebel (21) umfassen, welcher in dem Gehäuse (1) schwenkbar angebracht ist, wobei der Hebel eine Raste (21 a) aufweist, in welche die Nocke (20a) in Eingriff gebracht werden kann.

5. Schloß nach Anspruch 1 oder Anspruch 2, **dadurch gekennzeichnet, daß** das Schloß ein Zylinderschloß umfaßt, das darin die Nocke (40a) aufweist, und daß das Schloß eine Zuhaltung (44) enthält, welche in dem Gehäuse schwenkbar angebracht ist, wobei die Zuhaltung eine erste Raste (44b) aufweist, welche mit einem Vorsprung (36) auf dem Riegel in Eingriff gebracht werden kann, um den Riegel in seiner entriegelten Position zu halten, und eine zweite Raste (44d) mit dem Riegel in Eingriff gebracht werden kann, um den Riegel in seiner verriegelten Position zu halten, und daß die Nocke (40a) in eine Raste in dem Riegel (35) in Eingriff gebracht werden kann, um den Riegel aus der entriegelten in die verriegelte Position zu bewegen, wobei eine Drehung der Nocke die Zuhaltung anfänglich in eine Position bewegt, in welcher die erste Raste außer Eingriff mit dem Vorsprung auf dem Riegel liegt, um den Riegel zu erlauben, sich in Richtung der verriegelten Position zu bewegen, und, wenn der Riegel in die verriegelte Position bewegt worden ist, sich der Vorsprung in einer Position befindet, in welcher dieser in die zweite Raste in der Zuhaltung eingreifen kann, wobei die Zuhaltung durch eine Feder (45) in Eingriff mit der Nocke und mit dem Vorsprung auf dem Riegel gezwungen wird.

6. Schloß nach Anspruch 5, **dadurch gekennzeichnet, daß** das Schloß ferner eine Falle (5) und eine Zylinder-zu-Falle-Einheit enthält, wobei die Anordnung derart ist, daß, falls der Zylinder (40) betätigt

wird, um die Nocke (40a) zu veranlassen, sich zu drehen, um den Riegel (35) aus der verriegelten Position zurück zu ziehen, eine weitere Drehung der Nocke über die Zylinder-zu-Falle-Einheit dahin gehend wirksam ist, die Falle (5) zurück zu ziehen.

7. Schloß nach Anspruch 6, **dadurch gekennzeichnet, daß** Mittel vorgesehen sind, um die Zylinder-zu-Falle-Einheit aus einem Eingriff mit der Nocke zu bewegen, wenn der Riegel in die verriegelte Position bewegt ist.

8. Schloß nach Anspruch 6, **dadurch gekennzeichnet, daß** die Zylinder-zu-Falle-Einheit einen Hebel (55) enthält, welcher an einem Ende mit einer Falleneinheit verbunden ist und welcher an seinem anderen Ende mit einem Vorsprung (55a) versehen ist, welcher von der Nocke (40a) berührt werden kann, wobei der Hebel (55) vorzugsweise einen weiteren Vorsprung hat, welcher so angeordnet ist, daß dieser von dem Vorsprung (36) auf dem Riegel (35) berührt werden kann, wenn der Riegel in die verriegelte Position bewegt wird, um den Vorsprung (55a) an dem anderen Ende des Hebels aus der Bewegungsbahn der Nocke heraus zu bewegen.

Revendications

1. Serrure pour une porte ou autres présentant un coffre ou boîtier (1) et un ensemble de pêne dormant qui comprend un pêne (15, 35a) et un mécanisme d'entraînement comprenant une came rotative (20a, 40a) qui est adaptée pour être actionnée par une clé, dans laquelle un levier (18, 38) est agencé entre le mécanisme d'entraînement et le pêne (15, 35a) et qui est agencée de sorte que, lorsque le levier est actionné par le mécanisme d'entraînement afin de déplacer le pêne d'une position de non verrouillage à une position de verrouillage, la configuration du levier est telle qu'un mouvement additionnel est appliqué au pêne afin d'augmenter sa course, le levier (18, 38) étant monté avec possibilité de pivotement sur une broche (19, 39) qui est montée dans le coffre (1), et le levier (18, 38) étant agencé pour être mis en prise par la came durant la rotation de cette dernière, de façon à déplacer le pêne vers la position de verrouillage, le levier pivotant autour de la broche (19, 39) et augmentant le mouvement latéral, ou la course, du pêne, le levier étant arrangé de sorte qu'il ne joue aucun rôle dans le déplacement du pêne de la position de verrouillage à la position de non verrouillage, **caractérisée en ce que** le levier se met en prise avec une surface du pêne lorsqu'il déplace le pêne vers la position de verrouillage, et **en ce que** le levier est situé totalement à l'intérieur du coffre à la fois dans les positions de verrouillage et non verrouillé du pêne.

2. Serrure selon la revendication 1, **caractérisée en ce que** le levier est configuré de sorte que lorsqu'il est mis en prise par la came durant la rotation de cette dernière, et qu'il met en prise ladite surface du pêne pour déplacer le pêne vers la position de verrouillage, son mouvement de pivot est tel qu'il augmente le mouvement latéral, ou la course, du pêne d'au moins 3 mm.

3. Serrure selon la revendication 1 ou la revendication 2, **caractérisée en ce que** la serrure comprend une serrure encastrée présentant une pluralité de pièces de retenue (24) destinées à immobiliser le pêne dans l'une quelconque de ses positions de verrouillage ou non verrouillé, les pièces de retenue étant montées avec possibilité de pivotement sur une broche (26) qui est montée dans le coffre, et chaque pièce de retenue présentant une première encoche (24b) qui peut être mise en prise avec une saillie (16) sur le pêne (15) afin de retenir le pêne dans sa position de non verrouillage, et une seconde encoche (24d) pouvant être mise en prise avec le pêne afin de retenir ledit pêne dans sa position de verrouillage, et **en ce que** la came est prévue sur un mécanisme d'engagement de pêne (20) et peut être mise en prise dans une encoche (15d) dans le pêne (15) de façon à déplacer le pêne depuis la position de non verrouillage vers la position de verrouillage, la rotation de la came déplaçant initialement les pièces de retenue (24) vers une position dans laquelle les premières encoches (24b) sont hors de prise avec la saillie (16) sur le pêne, afin d'autoriser ledit pêne à être déplacé vers la position de verrouillage, et lorsque le pêne a été déplacé vers la position de verrouillage, la saillie étant positionnée de sorte qu'elle peut mettre en prise les secondes encoches dans les pièces de retenue, les pièces de retenue étant sollicitées en prise avec la came et avec la saillie sur le pêne par des ressorts respectifs (25).

4. Serrure selon la revendication 3, **caractérisée en ce qu'**un moyen est prévu pour immobiliser la came à la fois dans les positions de verrouillage et non verrouillé du pêne, ledit moyen d'immobilisation de came comprenant de préférence un levier chargé par un ressort (21) qui est monté avec possibilité de pivotement dans le coffre (1), ledit levier présentant une encoche (21 a) dans laquelle la came (20a) peut s'engager.

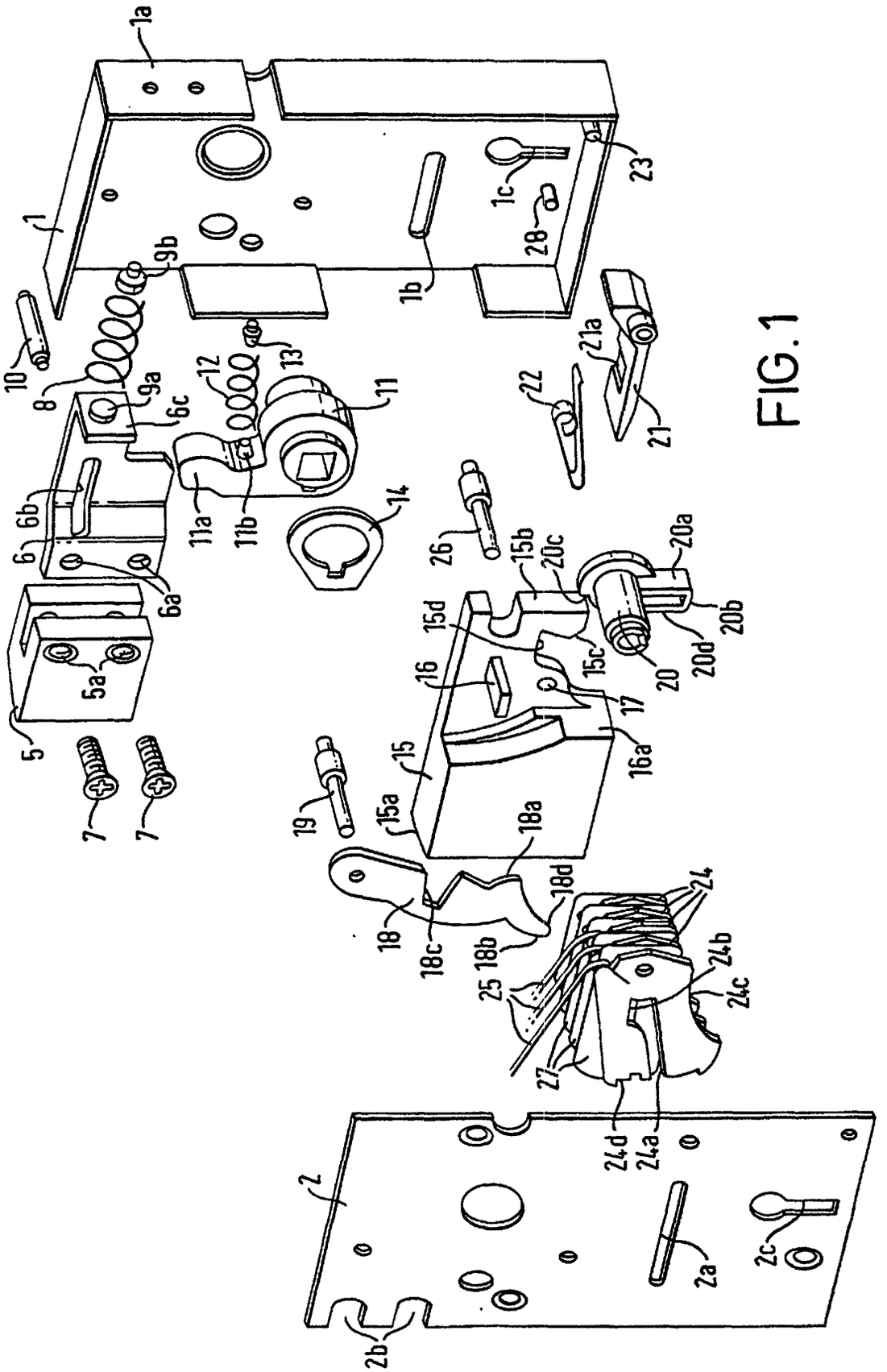
5. Serrure selon la revendication 1 ou la revendication 2, **caractérisée en ce que** la serrure comprend une serrure à cylindre incorporant ladite came (40a), et dans laquelle la serrure comprend une pièce de retenue (44) qui est montée avec possibilité de pivotement dans le coffre, la pièce de retenue présentant une première encoche (44b) qui peut être mise

en prise avec une saillie (36) sur le pêne afin de retenir le pêne dans sa position de non verrouillage, et une seconde encoche (44d) pouvant se mettre en prise avec le pêne afin de retenir ledit pêne dans sa position de verrouillage, et **en ce que** la came (40a) peut se mettre en prise dans une encoche dans le pêne (35) de façon à déplacer le pêne depuis la position de non verrouillage vers la position de verrouillage, la rotation de la came déplaçant initialement la pièce de retenue vers une position dans laquelle la première encoche est hors de prise avec la saillie sur le pêne afin de permettre que ledit pêne soit déplacé vers la position de verrouillage et, lorsque le pêne a été déplacé vers la position de verrouillage, la saillie étant dans une position dans laquelle elle peut mettre en prise la seconde encoche dans la pièce de retenue, la pièce de retenue étant sollicitée en prise avec la came et avec la saillie sur le pêne par un ressort (45).

6. Serrure selon la revendication 5, **caractérisée en ce que** la serrure comprend en outre un pêne demi-tour (5) et un ensemble de cylindre-vers-pêne demi-tour, l'agencement étant tel que, si le cylindre (40) est actionné pour provoquer la rotation de la came (40a) pour retirer le pêne (35) de la position de verrouillage, une rotation complémentaire de la came est effective, par l'intermédiaire dudit ensemble cylindre-vers-pêne demi-tour, afin de retirer le pêne demi-tour (5).

7. Serrure selon la revendication 6, **caractérisée en ce qu'**un moyen est prévu pour déplacer l'ensemble cylindre-vers-pêne demi-tour hors de prise avec la came lorsque le pêne est déplacé vers la position de verrouillage.

8. Serrure selon la revendication 6, **caractérisée en ce que** l'ensemble cylindre-vers-pêne demi-tour comprend un levier (55) qui est connecté avec possibilité de pivotement sur une extrémité d'un ensemble de pêne demi -tour, et qui est prévu à son autre extrémité avec une saillie (55a) qui peut être mise en prise par la came (40a), le levier (55) présentant de préférence une saillie complémentaire qui est agencée pour être mise en prise par la saillie (36) sur le pêne (35), lorsque ledit pêne est déplacé vers la position de verrouillage, afin de déplacer la saillie (55a) à ladite autre extrémité du levier hors du trajet de mouvement de la came.


1a
1
1c
23
28
1b
9b
10
8
9a
6c
12
13
11
22
21a
21
6b
6
6a
11a
11b
14
26
15b
20c
20a
15d
20b
16
15c
20
20d
17
5a
5
16a
15
7
7
19
15a
18a
18d
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18b
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24b
24c
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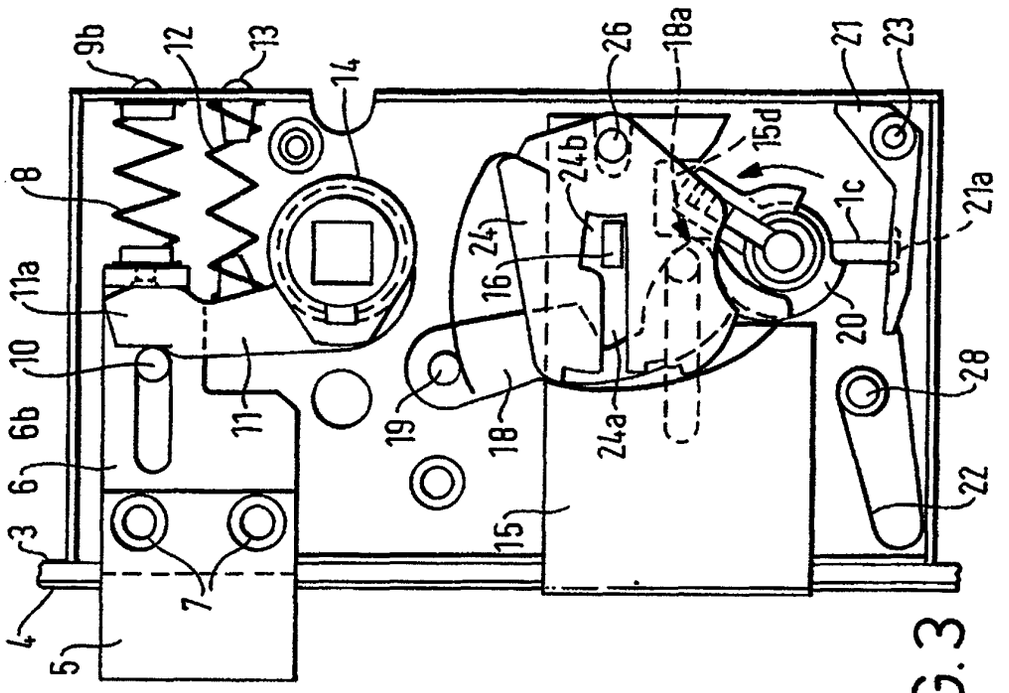
24d
24a
2
2a
2c
2b

FIG. 1


9b
12
13
14
26
18a
21
23
8
15d
24b
1c
21a
11a
24
16
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6b
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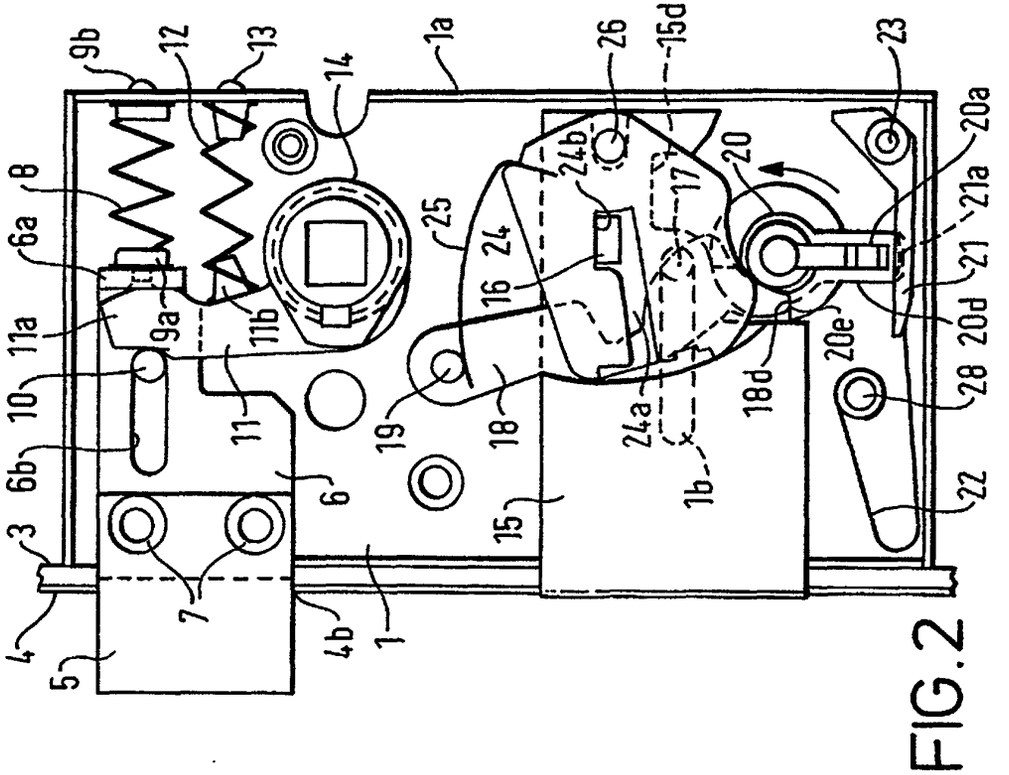
24a
6
22
3
15
7
4
5

FIG. 3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14
1a
26
15d
23
8
24b
20
20a
6a
25
24
17
21a
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11a
9a
11b
20d
10
20e
28
11
18d
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24a
6
1b
3
15
22
7
4b
1
4
5

FIG. 2

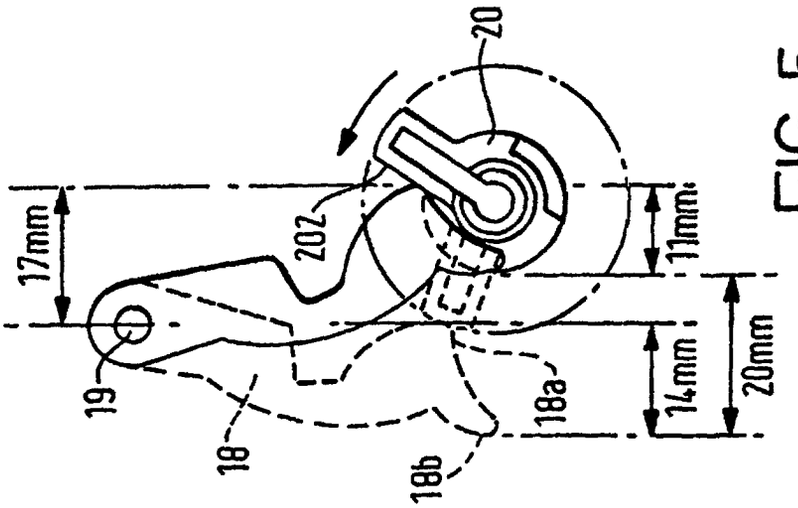
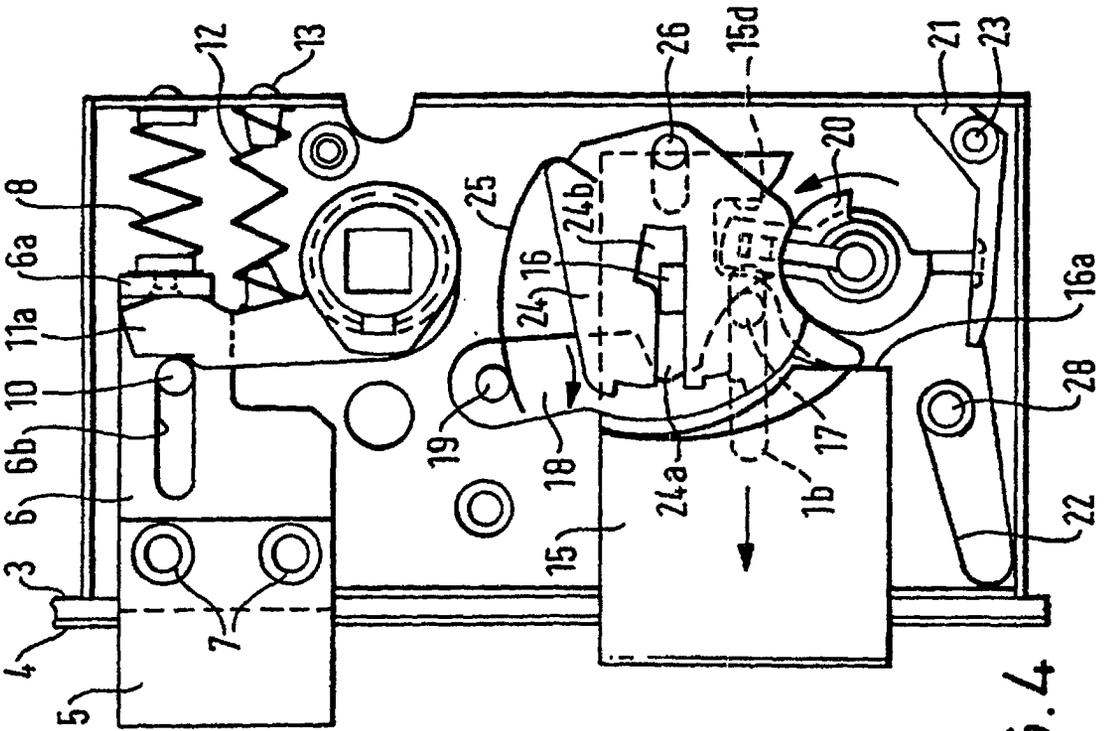

20
202
17mm
11mm
14mm
20mm
19
18
18b
18a

FIG. 5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13
26
15d
21
23
8
6a
11a
10
6b
6
3
4
5
7
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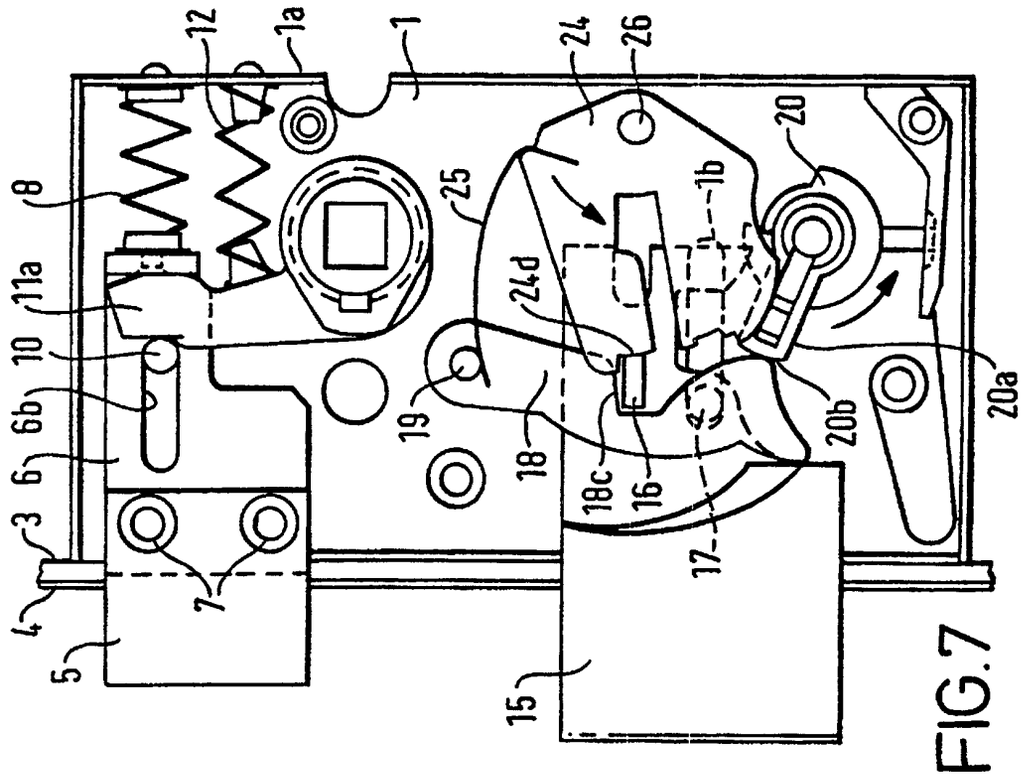
24b
16
24
19
18
15
24a
1b
17
20
16a
28
22

FIG. 4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1a
1
24
26
20
8
25
1b
11a
24d
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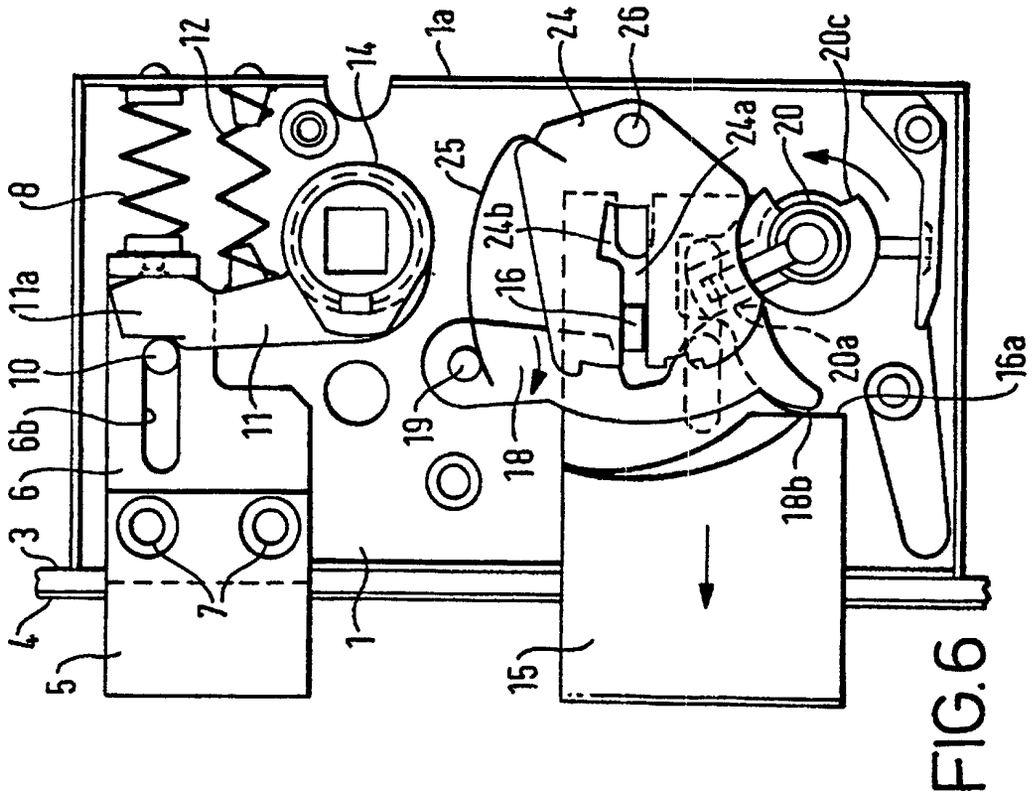
6b
19
18
18c
16
20b
20a
6
3
17
4
7
5
15

FIG.7


12
14
1a
24
26
20c
8
25
24a
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11a
24b
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19
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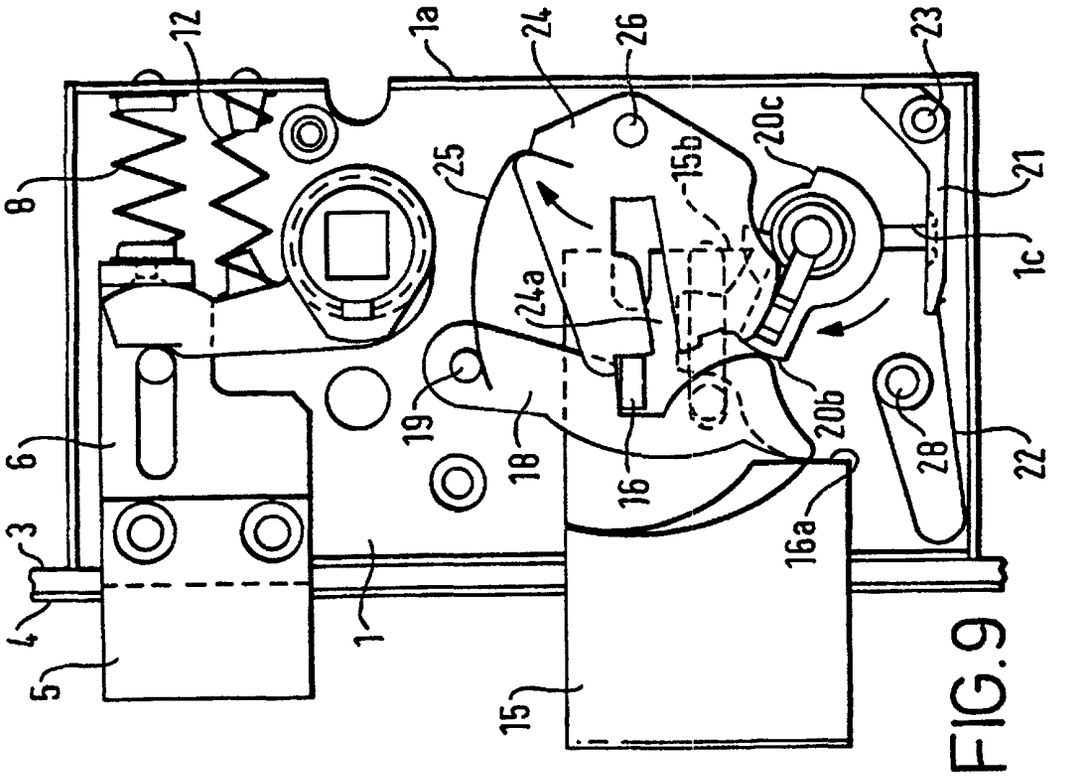
16a
6b
6
3
18b
4
7
1
5
15

FIG.6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23
8
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24a
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16
20b
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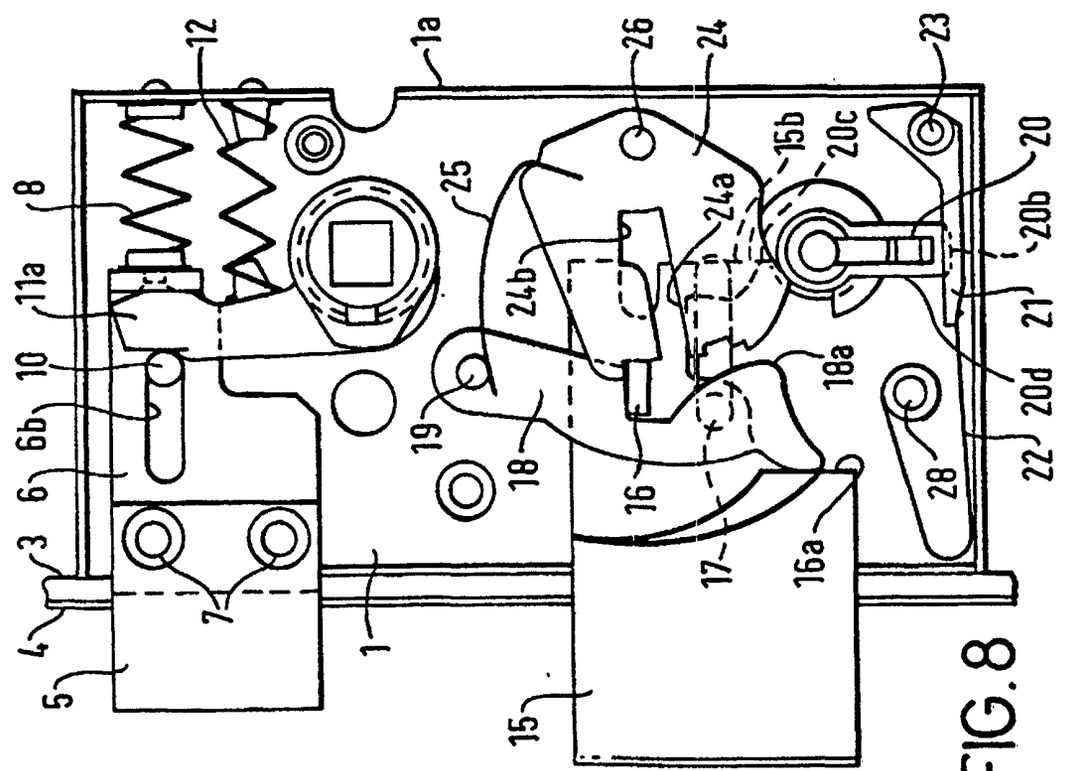
22
6
3
4
5
1
15
16a

FIG.9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1a
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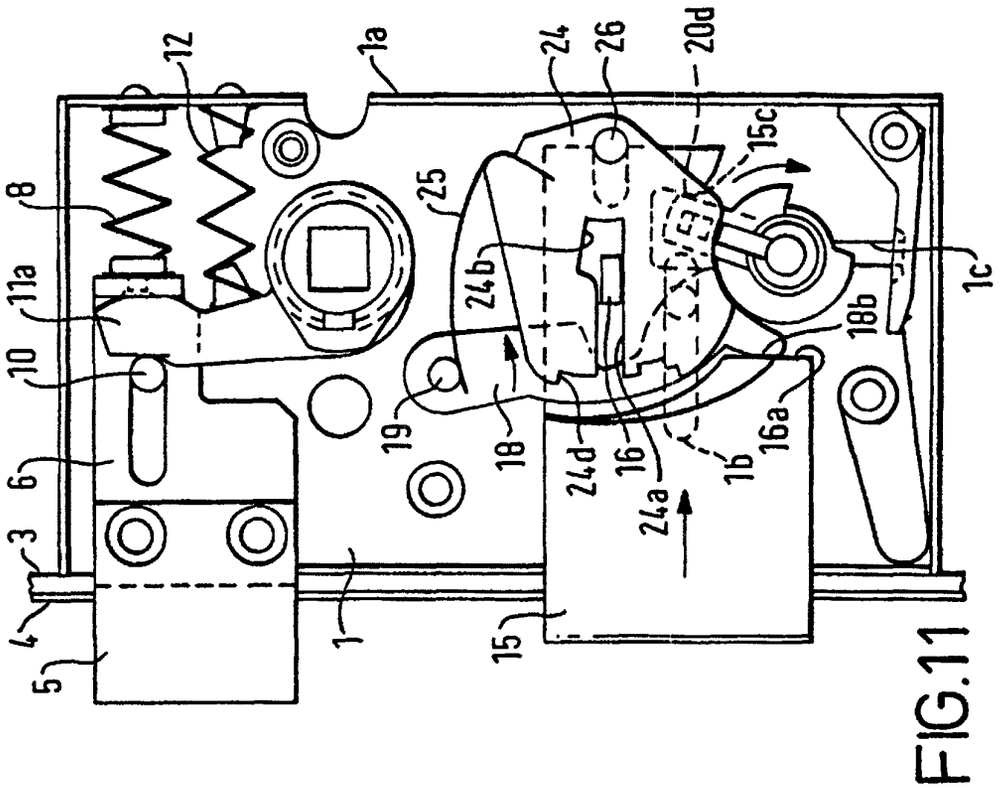
24
23
15b
20c
20
8
25
24a
20b
11a
24b
21
10
18a
19
18
20d
6b
16
22
6
28
3
17
16a
4
7
1
5
15

FIG.8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8
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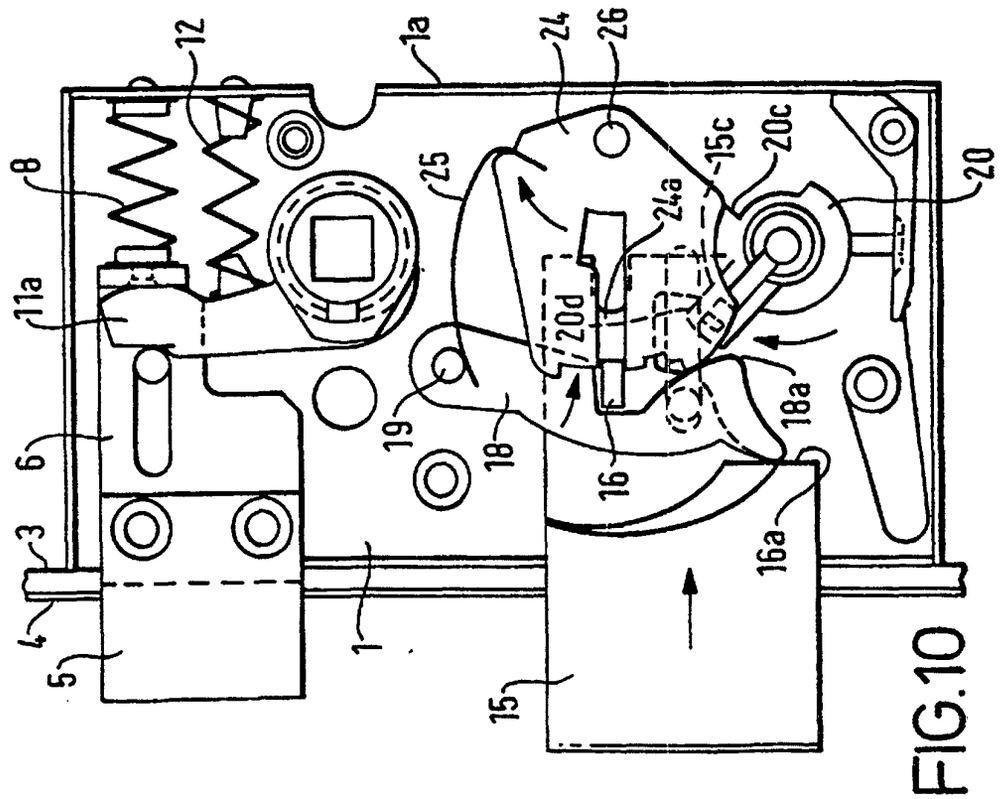
24d
16
1b
24a
3
4
5
1
15

FIG.11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26
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20c
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20d
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18a
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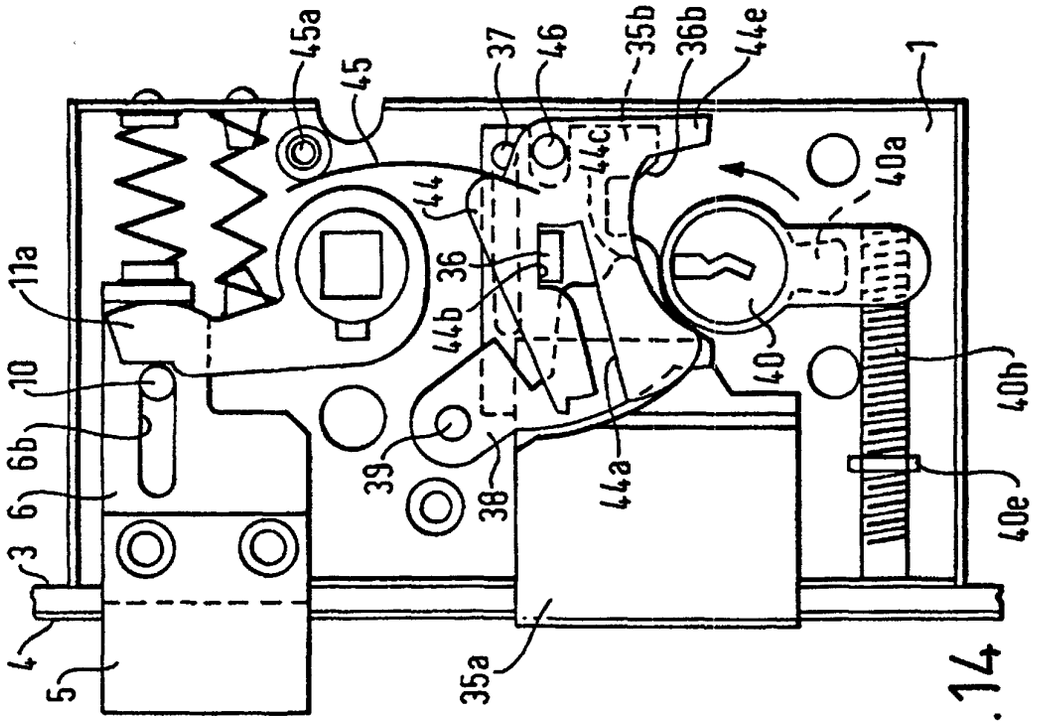
6
16a
3
4
5
1
15

FIG.10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44e
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11a
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6b
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5
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44c
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36
44b
40
40b
39
38
44a
40e
35a

FIG.14

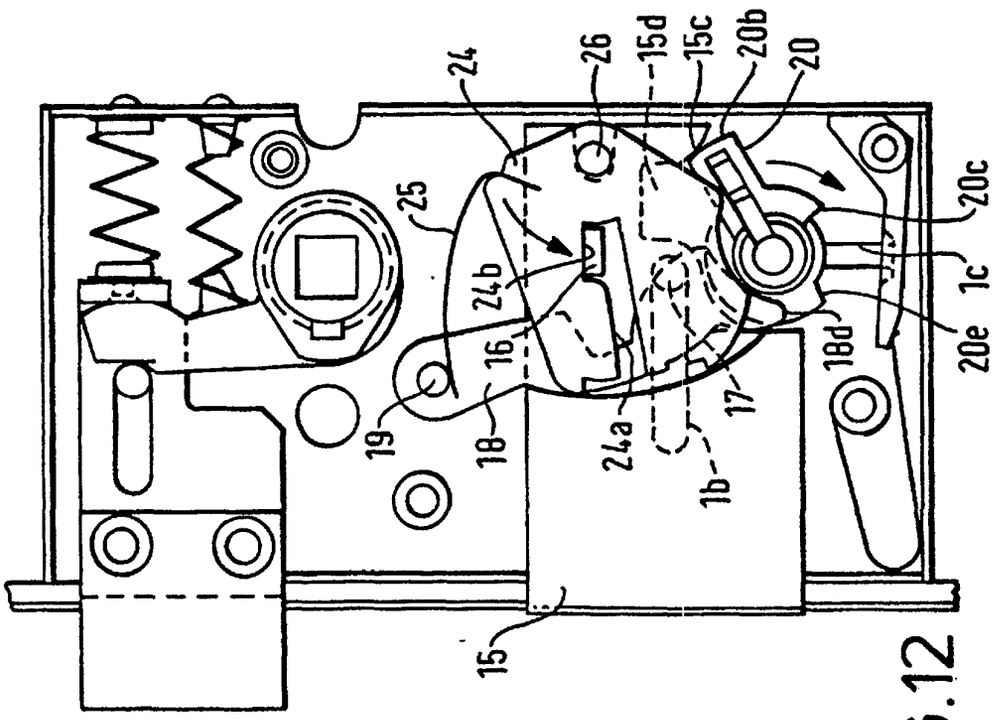
24
26
15d
15c
20b
20
25
20c
24b
1c
16
18d
20e
19
18
17
24a
1b
15

FIG.12

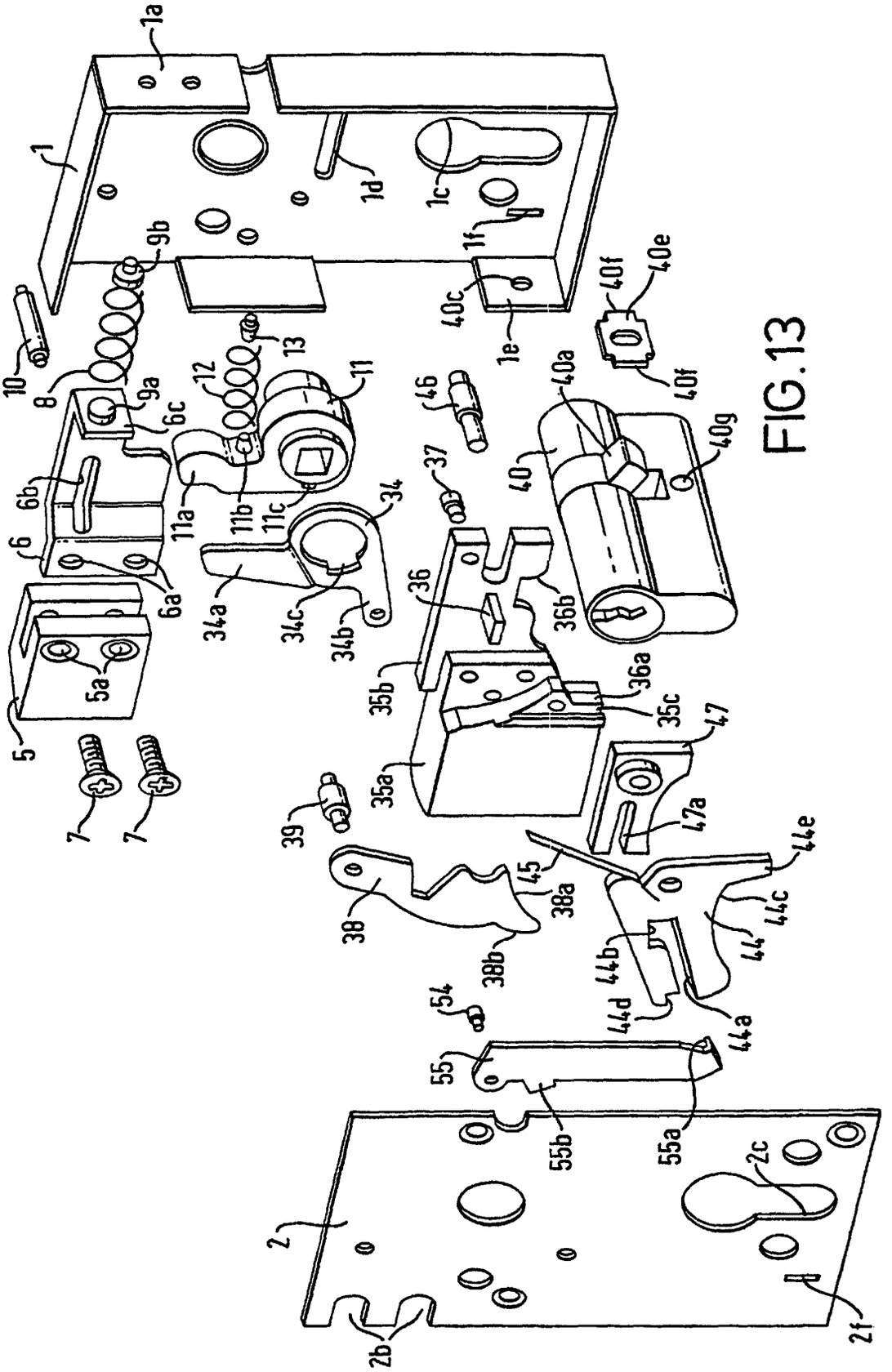
1a
1
1d
1c
1f
9b
40c
40f
40e
10
8
9a
1e
13
12
11
46
40a
6c
6b
11a
11b
11c
34
37
40
40g
6
6a
34a
34c
34b
36
36b
5a
35b
36a
35c
47
5
7
7
35a
47a
39
45
44e
38
38a
44c
44
38b
44b
54
44d
44a
55
55b
55a
2c
2
2b
2f

FIG.13

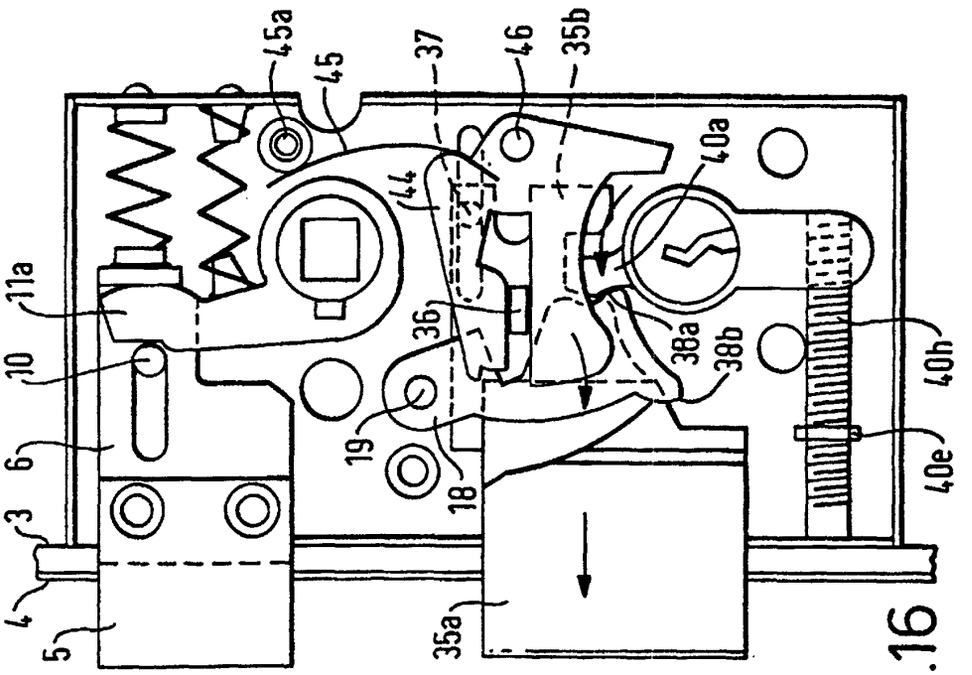
45a
45
37
46
35b
40a
44
11a
10
36
38a
38b
40h
19
6
18
40e
3
4
5
35a

FIG.16

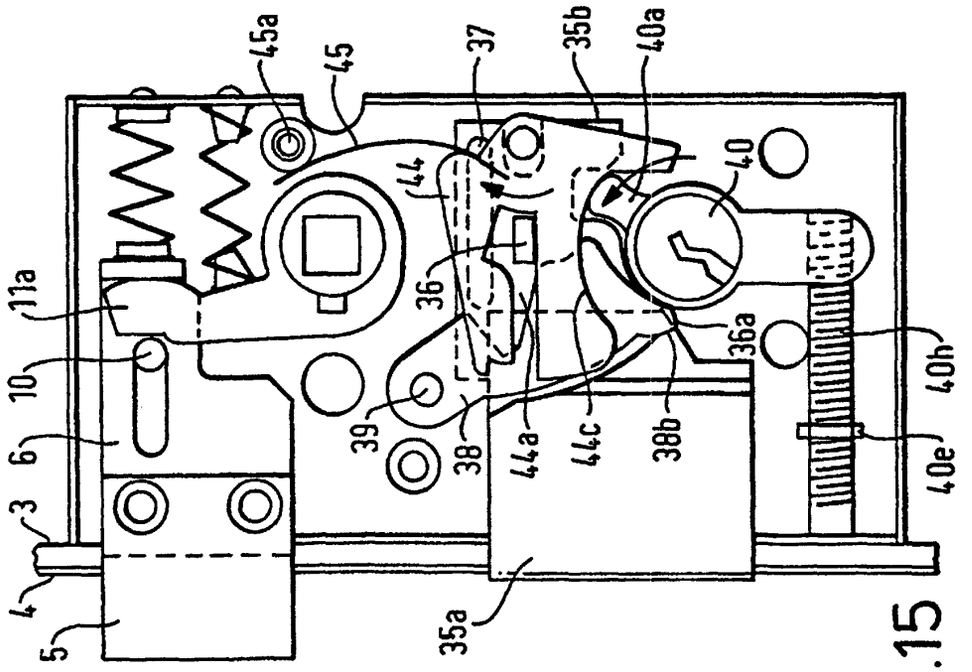
45a
45
37
35b
40a
44
40
11a
36
10
36a
40h
39
6
38
44a
44c
38b
40e
3
4
5
35a

FIG.15

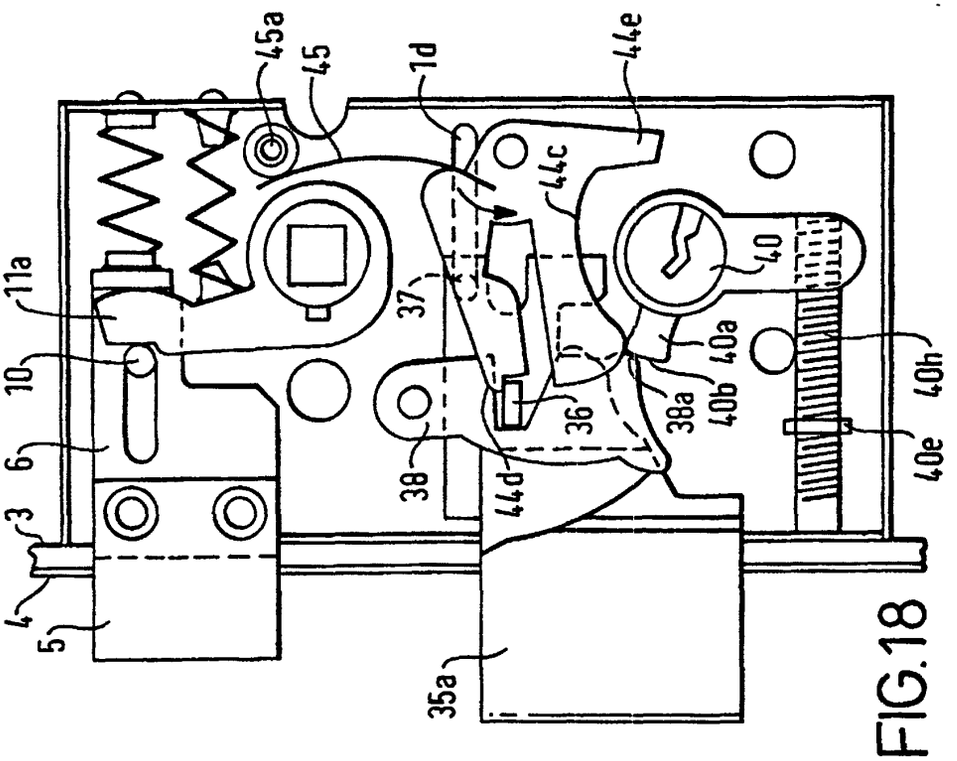
45a
45
1d
44e
44c
11a
37
40
10
40a
6
36
38a
40b
40h
38
44d
40e
3
4
5
35a

FIG.18

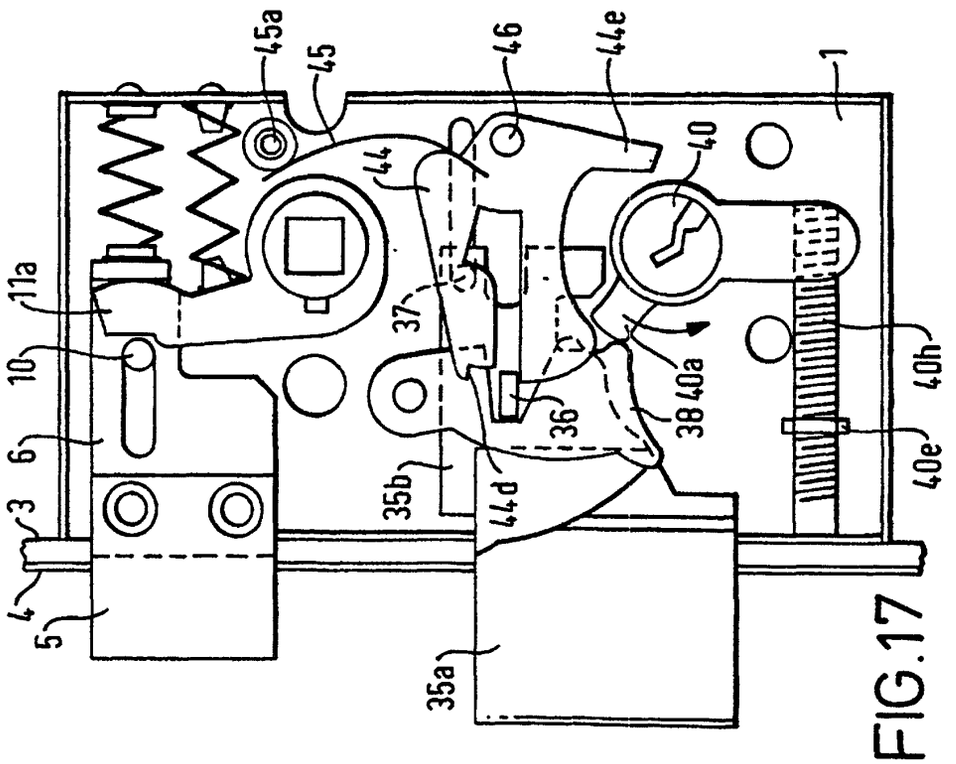
45a
45
46
44e
1
44
40
11a
37
10
40a
40h
6
36
38
40e
35b
44d
3
4
5
35a

FIG.17

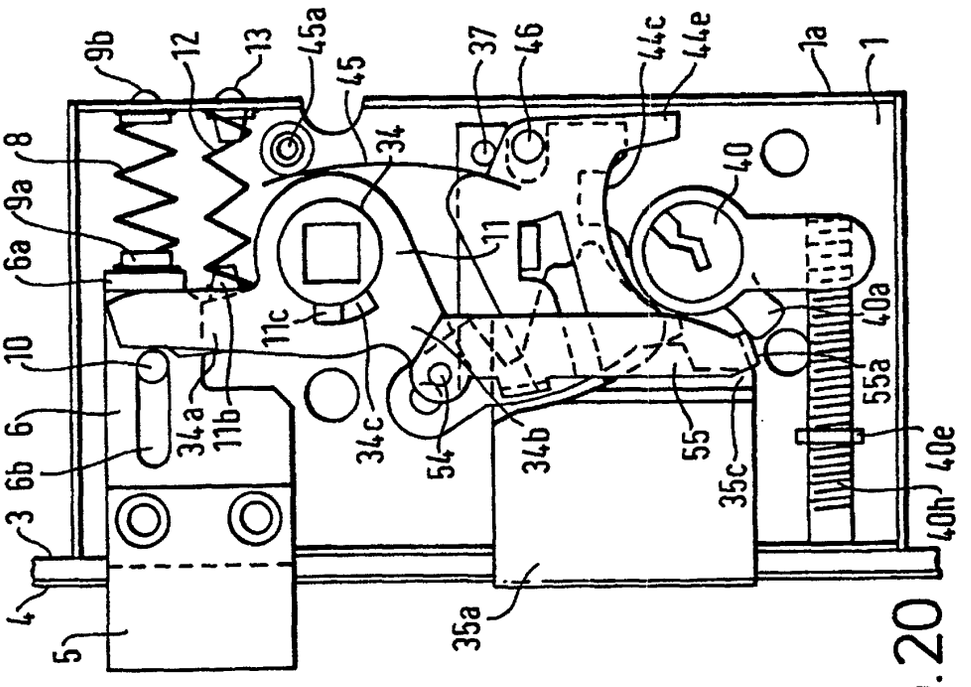
9b
12
13
45a
45
37
46
44c
44e
1a
1
8
9a
6a
34
40
11
10
11c
40a
6
34a
11b
34c
54
34b
55
55a
6b
35c
40e
3
40h
4
35a
5

FIG.20

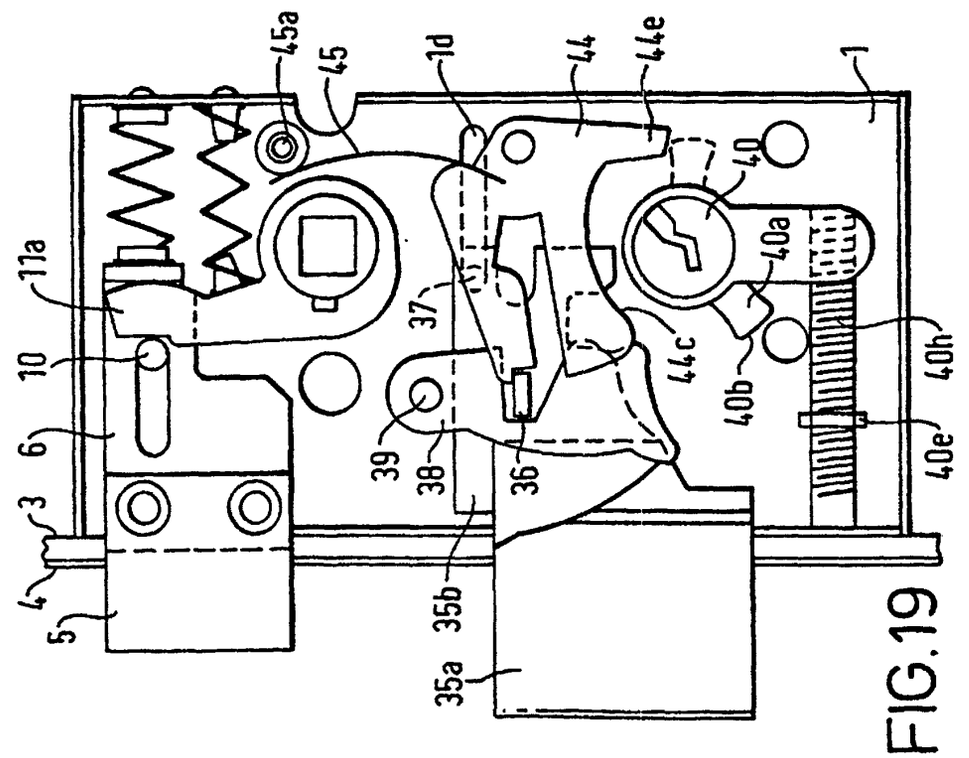
45a
45
1d
44
44e
1
40
11a
40a
37
10
44c
40b
40h
6
39
38
36
40e
3
4
35b
5
35a

FIG.19

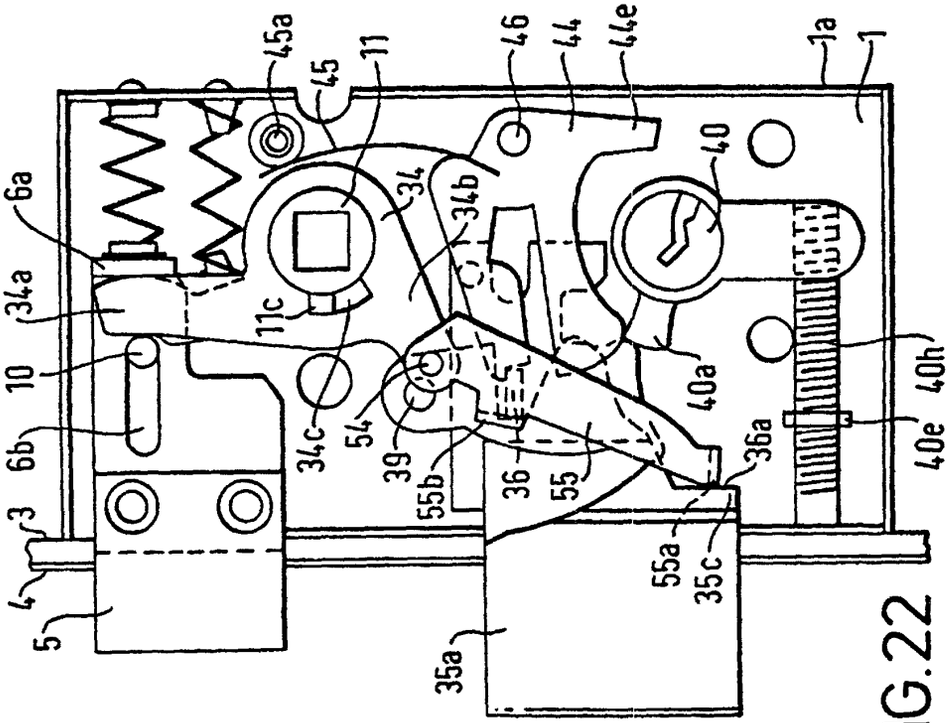
45a
45
11
46
44
44e
1a
1
6a
34a
10
6b
3
4
5
34
34b
40
11c
34c
54
39
55b
36
55
40a
36a
40h
40e
55a
35c
35a

FIG.22

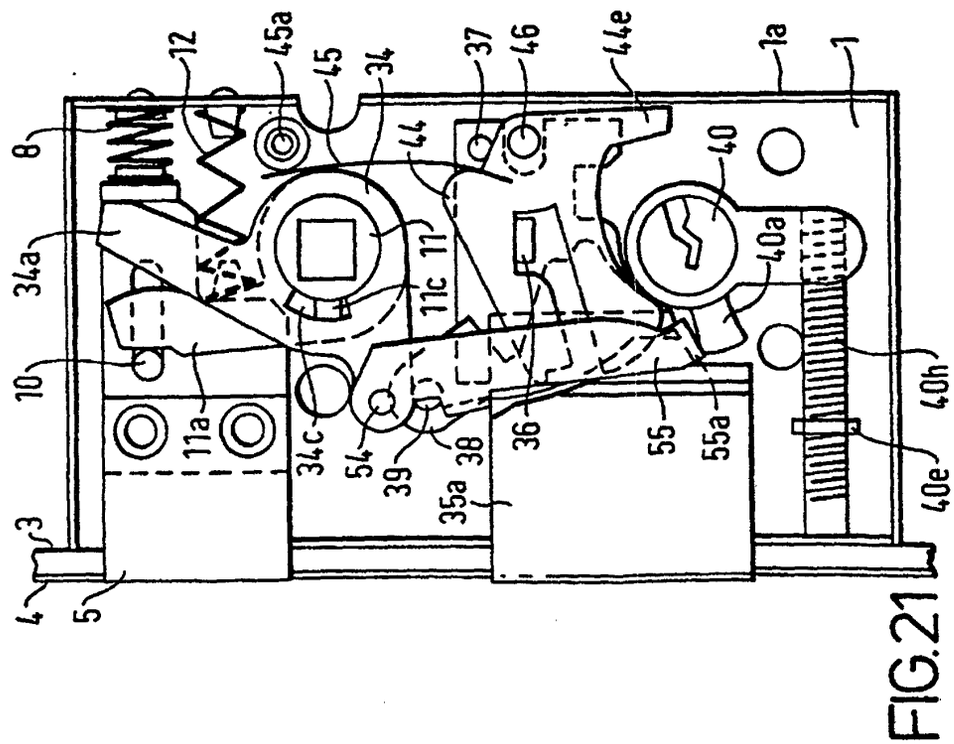
12
45a
45
34
37
46
44e
1a
1
8
34a
10
11a
3
4
5
44
11
11c
34c
54
39
38
35a
36
40
40a
55
55a
40h
40e

FIG.21