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(54) Lock and locking assembly for a door or window.

(57) A door or window lock comprising a spring loaded latch (2) and a deadbolt (3) is provided with a key operated deadlocking mechanism for deadlocking the deadbolt (3) in its operative position, the deadlocking mechanism comprising a pivotally mounted locking arm (71) which is movable between a deadlocking position in which it prevents movement of a rack (62) to retract the deadbolt (3) and an inoperative position in which the rack is free to move, a pivotally mounted tumbler (77) which is spring biased towards a rest position in which the tumbler prevents the locking arm (71) moving to its deadlocking position from its inoperative position and vice versa, and a follower member (76) which moves in response to turning of the key so that when the latter is turned to deadlock the deadbolt, the follower member (76) acts on the tumbler (77) to displace it from its rest position prior to engaging and moving the locking arm (71) to its deadlocking position and then allows the tumbler (77) to return to its rest position, and when the key is turned back to undeadlock the deadbolt, the follower member (76) acts on the tumbler (77) to displace it from its rest position prior to engaging and moving the locking arm (71) to its inoperative position and then allows the tumbler to return to its rest position. The lock may form part of a multi-point locking assembly having at least one additional remote locking device which is actuated simultaneously with the deadbolt.

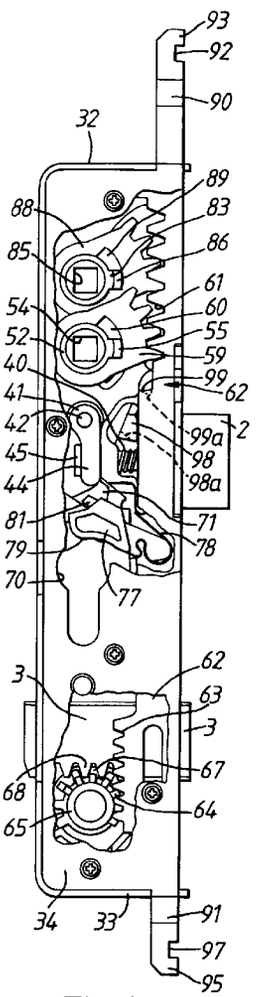


Fig.4

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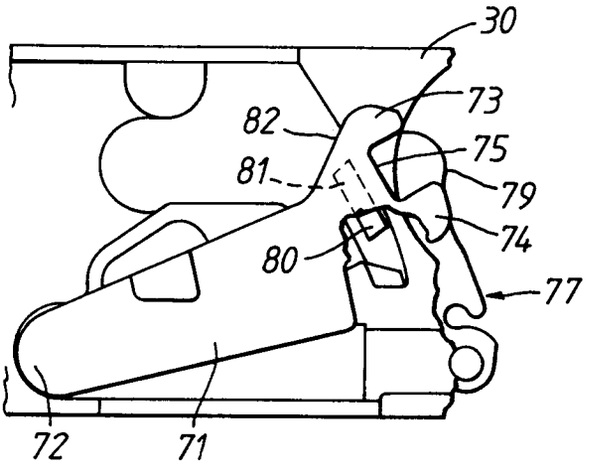


Fig.7a

The invention relates to door and window locks of the kind comprising a latch which is spring biased towards an operative position and is retractable to allow the door or window to close, a latch operating mechanism for retracting the latch when the door or window is to be opened, a deadbolt which is movable between an operative, advanced position and an inoperative, retracted position by a deadbolt operating mechanism, and a key operated deadlocking mechanism for deadlocking the deadbolt in its operative position.

The invention also relates to multi-point locking assemblies incorporating such locks and comprising at least one additional locking device which, in use, is connected to the lock such that a locking member of the additional device is advanced and retracted simultaneously with the deadbolt by operation of the deadbolt operating mechanism. Such multi-point locking assemblies are primarily intended for doors, especially doors made of reinforced UPVC for the residential market, although they can also be fitted to large windows.

According to a first aspect of the invention, in a lock of the kind described the deadlocking mechanism comprises a pivotally mounted locking arm which is movable between a deadlocking position in which it prevents movement of the deadbolt operating mechanism to retract the deadbolt and an inoperative position in which the deadbolt operating mechanism is free to move the deadbolt, a pivotally mounted tumbler which is spring biased towards a rest position in which the tumbler prevents the locking arm moving to its deadlocking position when in its inoperative position and prevents the locking arm moving to its inoperative position when in its deadlocking position, and a follower member which moves in response to turning of the key so that when the key is turned to deadlock the deadbolt, the follower member acts on the tumbler to displace it from its rest position prior to engaging and moving the locking arm to its deadlocking position and then allowing the tumbler to return to its rest position, and when the key is turned back to undeadlock the deadbolt, the follower member acts on the tumbler to displace it from its rest position prior to engaging and moving the locking arm to its inoperative position and then allowing the tumbler to return to its rest position.

The combination of the pivoted locking arm and the pivoted tumbler provides a particularly simple and reliable method of ensuring that the deadbolt cannot be deadlocked or undeadlocked without using the key.

Preferably the locking arm and the tumbler lie in different planes and have transversely projecting stops which interengage to prevent movement of the locking arm to its deadlocking position or back to its inoperative position when the tumbler is in its rest position.

Preferably the locking arm is arranged so that turning the key sufficiently in the undeadlocking direction when the locking arm is in its inoperative position causes the follower member to engage and move the locking arm away from the inoperative position in a direction opposite from the deadlocking position whereby the locking arm acts to retract the latch.

The latch operating mechanism may comprise a handle, a rotary cam plate which is rotatable by turning the handle, and a pivoted latch lever on which the cam plate acts to cause the lever to retract the latch against its spring bias when the handle is turned in one direction.

The deadbolt operating mechanism preferably comprises a handle, a follower gear which is rotatable by turning the handle, a reciprocable rack member which is engaged by the follower gear, and a transmission gear which is engaged by the rack member and which also engages a rack provided on the deadbolt so that the deadbolt moves in a direction which is substantially at right angles to the direction in which the rack member is movable. In this case, it is preferably the rack member of the deadbolt operating mechanism that the locking arm cooperates with to prevent retraction of the deadbolt when the locking arm is moved to its deadlocking position.

The handle of the deadbolt operating mechanism may be the same handle as that of the latch operating mechanism, the deadbolt being advanced by turning the handle from a neutral position in the opposite direction to that in which it is turned to retract the latch.

The deadbolt operating mechanism may also comprise a second handle which is on the opposite side of the lock from the first handle and is rotatable about an axis offset from that of the first handle, the second handle acting on a second follower gear which engages the rack member so that the deadbolt can also be operated by turning the second handle.

Preferably the transmission gear is a stepped gear so that the linear travel of the rack member produces a greater linear travel of the deadbolt. Accordingly, the deadbolt may have a throw which is considerably greater than in conventional locks of the same size.

Preferably the lock comprises a casing formed by a die-cast internal frame providing a rear and two opposite end walls of the casing, and two cover plates fastened to the frame on opposite sides thereof. The internal frame may be made of aluminium or zinc alloy and arranged to support some of the components of the lock, such as the locking arm and the tumbler, and the cover plates may be made of steel, preferably stainless steel, and arranged to support other pivotally mounted components of the lock such as the handles and the latch lever. Such a construction facilitates the manufacture and assembly of the lock, and may also be used advantageously in other forms of lock.

As mentioned earlier, the lock of the present in-

vention is intended primarily for use as part of a multi-point locking assembly. In this case the locking member of the or each additional locking device of the assembly may be a bolt or a pivoted hook which is advanced and retracted in response to linear movement of a connector bar between the lock and the additional locking device by the deadbolt operating mechanism of the lock.

In a preferred arrangement the locking member of the or each additional locking device is a hook which is pivoted between its advanced and retracted positions by linear movement of a slide plate which is connected to the connector bar and which is connected to the hook by means of a pin carried by either the hook or the slide plate and engaging in a slot in the slide plate or the hook respectively.

Usually the assembly includes a keep bar which, in use, is fitted to the fixed frame surrounding the door or window and which is provided with an aperture through which the locking member of the additional locking device projects when the door or window is closed and the locking member is advanced to its operative position. In this case the side face of the free end portion of the locking member may be chamferred on the side facing the side on which the door or window opens, so that the chamferred face will engage the side edge of the keep bar aperture and exert a camming action which draws the door or window tightly closed as the locking member is advanced through the aperture.

Preferably the position of the camming side edge of the aperture is adjustable in order to ensure that the desired pull-in of the door or window is achieved, and for this purpose the aperture is defined by a slot in a separate keep plate which is mounted on the keep bar so that the slot registers with a slot in the keep bar, the position of the keep plate on the keep bar being adjustable. In a particularly preferred arrangement, the keep plate is secured to the keep bar by at least one screwed connection, and the position of the keep plate relative to the keep bar is set and maintained by a series of longitudinal serrations on the underside of the keep plate which engage with a corresponding series of longitudinal serrations provided on the surface of the keep bar when the or each screwed connection is tightened.

As will be appreciated, the preferred arrangement for mounting and driving the hook of the or each additional locking device, and the preferred arrangement for adjustably mounting the corresponding keep plate on the keep bar may also be used in other forms of multi-point locking assembly.

One example of a multi-point locking assembly embodying the various features of the invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a side view of the locking assembly showing a central primary lock and two remote auxiliary locking devices attached to a common face bar, and a keep bar and associated recesses;

Figure 2 is a rear view of the face bar;

Figure 3 is a front view of the keep bar;

Figure 4 is a side view of the primary lock removed from the face bar and with part of its casing cut away to show details of the internal construction of the lock;

Figure 5 is a view of the other side of the lock shown in Figure 4, with part of the casing cut away to show further details of the internal construction;

Figure 6 is a front view of the lock shown in Figures 4 and 5;

Figures 7a, 7b and 7c are views of a portion of the lock shown in Figures 4 to 6 illustrating the interaction between a locking arm and a tumbler at three different stages in the operation of the lock, part of the locking arm being cut away in each view to show detail of the tumbler;

Figures 8a and 8b are views of another portion of the lock illustrating the interaction between the locking arm and a latch mechanism at two different stages in the operation of the lock;

Figures 9a and 9b are side views of the top and bottom auxiliary locking devices respectively;

Figure 10 is a front view, to a larger scale, of a portion of the keep bar of Figure 3 showing a keep plate mounted on the bar;

Figure 11 is a front view of the portion of the keep bar shown in Figure 10 with the keep plate removed; and,

Figure 12 is a rear view of the keep plate removed from the keep bar.

The locking assembly shown in the drawings comprises a central primary lock 1 having, as is conventional, a latch 2 and a deadbolt 3, and two separate auxiliary locking devices 4 and 5 having locking members 6, 7 respectively which, in this example, are in the form of pivoted hooks. The assembly also comprises a single face bar 8 for the lock 1 and the auxiliary locking devices 4 and 5, a keep bar 9 and, optionally, four recess liners 10, 11, 12 and 13. In use, the primary lock 1 and the auxiliary locking devices 4, 5 are set into corresponding vertically aligned recesses cut in the vertical free edge of a door or window with a predetermined spacing between them, the auxiliary locking devices 4 and 5 being positioned near the top and bottom respectively of the edge, and the primary lock 1 being positioned substantially centrally. The vertical edge of the door or window is also provided with a vertical groove in line with the recesses, and the face bar 8 is fitted into this groove, being screwed securely to the door or window and to the lock 1 and the top and bottom locking devices 4, 5 through pre-formed screw holes such as indicated at 14. Also pre-formed in the face bar 8 are slots 15 and

16 positioned to allow the latch 2 and the deadbolt 3 respectively to pass through, and slots 17 and 18 positioned to allow the auxiliary locking hooks 6 and 7 respectively to pass through. On its rear face, i.e. within the groove, the face bar 8 carries two longitudinally slidable connector bars 19 and 20 which connect the primary lock 1 to the auxiliary locking devices 4, 5 respectively (as described later in more detail) for the purpose of causing the locking hooks 6 and 7 to be advanced into operative locking positions or retracted into inoperative positions simultaneously with the deadbolt 3 when the latter is caused to advance to its operative locking position or retract to its inoperative position. As shown in Figure 2, each connector bar 19, 20 is held captive and guided on the face bar 8 by means of headed location pins 21 which extend through slots 22 in the connector bars and are secured to the face bar 8.

The edge of the surrounding door or window frame which faces the vertical free edge of the door or window when the latter is closed is provided with recesses which are sized and positioned to receive the latch 2, the deadbolt 3 and the auxiliary locking hooks 6 and 7 when these are in their operative advanced positions, and the recess liners 10, 11, 12 and 13 (if provided) are fitted into these recesses. The edge of the surrounding frame is also provided with a vertical groove in line with the recesses, and the keep bar 9 is fitted into this groove and screwed securely to the frame through pre-formed screw holes such as indicated at 23. The keep bar 9 has slots 24 and 25 to allow the latch 2 and the deadbolt 3 respectively to pass through the keep bar into their recesses, and two further slots 26 and 27 to allow the locking hooks 6 and 7 to pass through the bar 9 into their respective recesses. The keep bar 9 is completed by two slotted keep plates 28, 29 which are adjustably mounted on the bar (as described later in more detail) over the slots 26, 27 to adjust the effective apertures through the bar.

The primary lock 1 comprises a casing formed by a die-cast internal frame 30 (e.g. of aluminium or zinc alloy) defining the rear wall 31 and opposite end walls 32, 33 of the casing, and two cover plates 34, 35 (preferably of stainless steel) screwed to the internal frame 30 to form the opposite side walls of the casing. The frame 30 defines tapped screw holes 36 for the attachment of the face bar 8 to the front of the casing, and portions 37 and 38 for the mounting and guidance of the latch 2 and deadbolt 3 respectively.

The latch 2 is attached to a latch bolt 39 which is slidably mounted in the frame 30 of the casing so that the latch is movable between an operative advanced position as shown for example in Figures 4 and 5 and a retracted position as shown in Figure 8b, the latch being biased towards the advanced position by a latch spring 40 which surrounds the latch bolt 39 and acts between the frame 30 and the latch 2. The latch 2 is of conventional design, being flat on one side and having a curved or angled cam surface on its other side for causing the latch to retract automatically when the door or window is closed.

For the purpose of retracting the latch 2 when the door or window is to be opened, a two armed latch lever 41 is pivotally mounted in the casing by means of a shaft 42 which is journalled in aligned holes 43 in the side plates 34 and 35 of the casing. One arm 44 of the lever 41 is forked and extends on opposite sides of the latch bolt 39 immediately in front of a flange 45 at the tail end of the latch bolt. The other end 50 of the latch lever 41 overlaps a cam plate 51 mounted on a bush 52 which is rotatably mounted at its opposite ends in aligned holes 53 in the casing side plates 34 and 35, the bush 52 having a square sectioned bore 54 for receiving the spindle of a handle (not shown), which may be a lever or a knob. The bush 52 carries a follower bar 55 which extends transversely through the casing parallel to the axis of the bush and is supported and guided at its opposite ends in arcuate slots 56 in the casing side plates 34 and 35. The follower bar 55 extends through a sector shaped slot 57 in the cam plate 51 to provide a lost motion drive coupling between the bush 52 and the cam plate 51. In use, the handle which drives the bush 52 is located on the inside face of the door or window (i.e. on the side facing towards the viewer in Figure 4 and away from the viewer in Figure 5) and turning the handle in a clockwise direction with respect to Figure 5 will cause the follower bar 55 to engage one end of the sector slot 57 and thereby rotate the cam plate 51 with the bush. This causes a lug 58 carried by the cam plate 51 to engage the arm 50 of the latch lever 41 to rock the lever so that its other arm 44 acts on the tail flange 45 of the latch bolt 39 to retract the latch 2 against the action of the spring 40. Releasing the handle allows the spring 40 to drive the latch back to its advanced position, thereby returning the latch lever 41, the cam plate 51, the bush 52 and the handle to their rest positions.

The handle which engages in the bore 54 of the bush 52 also serves to operate the deadbolt 3. For this purpose a sector gear 59 is also mounted on the bush 52 and is coupled thereto by means of a sector slot 60 in the gear 59 through which the follower bar 55 of the bush extends to form a lost motion coupling. The teeth of the sector gear 59 engage with a first row of teeth 61 on a rack member 62 which extends longitudinally through the casing near its front face and is guided for reciprocation in the longitudinal direction. A second row of teeth 63 on the rack member 62 at a position longitudinally spaced from the first row of teeth 61 engages with a first ring of teeth 64 on a stepped gear 65 having a shaft which is rotatably mounted in aligned holes 66 in the casing side plates 34 and 35. A second ring of teeth 67 of the stepped gear 65 engages with the teeth of a rack 68 on the side of the

deadbolt 3. Rotation of the bush 52 by its handle in a clockwise direction from the position shown in Figure 4 (i.e. the opposite direction to that in which it is turned to retract the latch) rotates the sector gear 59 with it and hence drives the rack member 62 downwards, thereby rotating the stepped gear 65 in a clockwise direction and driving the deadbolt 3 to an operative advanced position in which it projects from the casing. The pitch of the second ring of teeth 67 of the stepped gear 65 is greater than the pitch of the first ring 64 so that the throw of the deadbolt 3 is greater than the longitudinal displacement of the rack member 62.

As will be appreciated, the sector slot 57 in the cam plate 51 allows the bush 52 to be turned by the handle to drive the deadbolt 3 to its advanced position without moving the cam plate and the latch. Similarly, the sector slot 60 in the sector gear 59 allows the bush 52 to be turned by the handle to retract the latch without moving the sector gear and the rack member with the deadbolt 3 is in its retracted position. The sector slot 60 also allows the handle to be returned to its rest position without retracting the deadbolt 3 after it has been advanced. In this condition, however, turning the handle to retract the latch will cause the follower bar 55 to act on both the cam plate 51 and the sector gear 59 so that the latch and the deadbolt are retracted simultaneously.

The lock 1 also has a deadlocking mechanism for locking the deadbolt 3 after it has been advanced to its operative position. This mechanism comprises a key operated cylinder lock 69 (shown in Figures 8a and 8b only) which is supported within the casing by the frame 30, the side plates 34 and 35 being provided with aligned key holes 70 for the key 70a of the cylinder lock. In addition, the deadlocking mechanism comprises a locking arm 71 which is pivotally supported at one end 72 by the frame 30 and has a pair of jaws 73, 74 defining a recess 75 at its other end facing towards the cylinder lock. The locking arm 71 has an undeadlocked position as shown in Figures 5, 7a and 8a, in which the jaw 74 (but not the jaw 73) lies in the path of a follower 76 on the cylinder of the cylinder lock. In this undeadlocked position the rack member 62 is free to reciprocate so that the deadbolt 3 can be advanced and retracted as desired. The locking arm 71 also has a deadlocked position as shown in Figures 7b and 7c in which the jaw 73 (but not the jaw 74) lies in the path of the cylinder follower 76, and in which the locking arm 71 is operative to prevent movement of the rack member 62 and thereby lock the deadbolt 3 in its advanced position. For this purpose the locking arm has a lug 98 which projects laterally from one of its sides and engages with a shoulder 99 on the rack member 62 when the latter has been moved to advance the deadbolt and the locking arm has been moved to its deadlocking position. Advantageously the shoulder 99 may be undercut as indicated by the dotted line 99a in Figure 4, and the cooperating edge of the lug correspondingly angled as indicated by the dotted line 98a.

The deadlocking mechanism also comprises a tumbler 77 for preventing movement of the locking arm 71 without using the key 70a in the cylinder lock 69. The tumbler 77 is pivotally mounted on the frame 30 of the casing and is biased by a leaf spring 78 towards a rest position as shown in Figures 7a and 7c, in which a cam surface 79 on the tumbler 77 lies in the path of the cylinder follower 76. The tumbler 77 has a stop 80 projecting from its side which faces towards the locking arm 71, and when the tumbler 77 is in its rest position and the locking arm 71 is in its undeadlocked position as shown in Figure 7a, the stop 80 lies in the path of a complementary stop 81 projecting from the side of the locking arm facing towards the tumbler 77, thereby preventing movement of the locking arm 71 from its undeadlocked position to its deadlocked position. When the key 70a is inserted in the cylinder lock and turned in the appropriate direction, the cylinder follower 76 will move into engagement with the cam surface 79 of the tumbler 77, causing it to cam outwards and thereby move the stop 80 out of the path of the locking arm stop 81 as the follower 76 moves into the recess 75 and engages the jaw 74 of the locking arm. Continued rotation of the key causes the follower 76 to pivot the locking arm 71 from the undeadlocked position to the deadlocked position shown in Figure 7b, at which point the follower 76 becomes disengaged from the recess 75 and moves clear of the tumbler 77 to allow it to spring back to its rest position as shown in Figure 7c. The stop 80 then again lies in the path of the locking arm stop 81, this time to hold the locking arm in the deadlocked position and prevent its return to the undeadlocked position. When the deadbolt 3 is to be undeadlocked, the key 70a is inserted into the cylinder lock and this time turned in the opposite direction to bring it back into contact with the cam surface 79 so that it is cammed outwards to move the stop 80 out of the path of the locking arm stop 81 before engaging the jaw 73 to pivot the locking arm 71 back to the undeadlocked position, whereupon the follower 76 moves clear of the jaw 73 and the cam surface 79 to allow the tumbler 77 to spring back to its rest position as shown in Figure 7a.

As will be seen from Figures 5 and 8a, in the undeadlocked position of the locking arm 71 the rear edge 82 of the locking arm engages the free end of the arm 44 of the latch lever 41, and rotation of the key 70a in the cylinder lock in the undeadlocking direction will eventually bring the cylinder follower 76 into engagement with the outside of the jaw 74 and thereby pivot the locking arm 71 in a direction away from the tumbler stop 80. This movement causes the locking arm 71 to pivot the latch lever 41 so that the arm 44 retracts the latch 2 as shown in Figure 8b. The key is

thus operative not only to lock and unlock the deadbolt 3 but also to retract the latch, and from either the inside or the outside of the door or window.

As mentioned earlier, the handle which cooperates with the bush 52 is located on the inside face of the door or window. In order to allow the deadbolt 3 to be actuated from outside, the lock 1 is provided with a second bush 83 which is mounted in a second pair of aligned holes 84 in the casing side plates 34 and 35 so that the bush 83 is rotatable about an axis parallel to but offset from the axis of the bush 52. The bush 83 has a square sectioned bore 85 for receiving the spindle of an outside handle (not shown), and carries a follower bar 86 which extends transversely through the casing and is supported and guided at its opposite ends by arcuate slots 87 in the casing side plates 34 and 35. A sector gear 88 which meshes with the first set of teeth 61 on the rack member 62 is mounted on the bush 83, and the follower bar 86 extends through a sector slot 89 in the gear 88 to provide a lost motion coupling between the bush and the gear. As will be appreciated from the arrangement shown in Figure 4, rotation of the sector gear 59 by its handle to cause the rack member 62 to advance or retract the deadbolt 3 will be followed by the sector gear 88, but without movement of the bush 83 and its associated handle due to the lost motion provided by the sector slot 89, and vice versa. It will also be noted that the bush 83 is not coupled to the latch operating mechanism, and the latch cannot therefore be retracted from outside the door or window except by inserting and turning the key 70a in the cylinder lock 69.

As shown, the opposite ends 90, 91 of the rack member 62 project from the top and bottom ends of the casing adjacent its front face so that, in use, they lie adjacent the rear face of the face bar 8. At its top end 90 the rack member 62 has a notch 92 cut in its front edge to form a lug 93 at its tip, and the rack member is connected to the lower end of the upper connector bar 19 by means of the lug 93 which fits into a hole 94 formed near the end of the bar 19 with the end of the bar received in the notch 92. At its lower end 91 the rack member 62 is connected in a similar manner to the upper end of the lower connector bar 20 by means of a lug 95 at the tip of the member 62 which fits into a hole 96 in the connector bar while the end of the bar is received in a notch 97 in the member 62. In this way the connector bars 19 and 20 will move longitudinally with the rack member 62.

Turning now to the upper auxiliary locking device 4 shown in Figures 1 and 9a, this comprises a shallow rectangular box-like casing 100 having its open side closed by a cover plate 101 screwed to the casing, and a front edge face 102 to which, in use, the face bar 8 is screwed. The locking hook 6 of the device 4 is pivotally mounted on a boss 103 within the casing 100, and the front edge face 102 of the casing is provided with an aperture (not shown) through which the end portion 104 of the hook 6 moves as the hook is pivoted between its operative advanced position as shown in Figure 1 and its inoperative retracted position as shown in Figure 9a. Also housed within the casing 100 is a slide plate 105 which is guided to move longitudinally within the casing parallel to its front edge face 102. The slide plate 105 has a leg 106 which projects from the lower end of the casing 100 adjacent its front edge face 102, and this leg 106 is connected to the upper end of the connector bar 19 by means of a tab 107 at the end of the leg 106 which fits into a hole 108 provided near the end of the bar 19 while the end of the bar is received in a notch 109 in the leg 106. The connector bar 19 thus causes the slide member 105 to follow the movement of the rack member 62 of the primary lock 1.

Within the casing 100 the hook 6 carries a pin 110 which is parallel to and offset from the pivot axis of the hook, and which projects firstly through a drive slot 111 in the slide plate 105 and then into an arcuate guide slot 112 provided in the cover plate 101, the centre of curvature of the guide slot 112 lying on the pivot axis of the hook 6. As a result of this pin and slot arrangement downward movement of the slide plate 105 caused by downward movement of the rack member 62 to drive the deadbolt 3 to its operative advanced position will simultaneously pivot the hook 6 from its inoperative position shown in Figure 9a to its operative advanced position in which it projects from the casing 100 as shown in Figure 1. Movement of the rack member 62, and hence the slide plate 105, in the opposite direction simultaneously retracts the deadbolt 3 and the hook 6.

The lower locking device 5 shown in Figures 1 and 9b is similar to the upper locking device 4 in having a casing 113 to which the face bar 8 is screwed and in which the hook 7 is pivotally mounted and arranged to be pivoted by longitudinal movement of a slide plate 114 also mounted within the casing, the hook 7 being connected to the slide plate 113 by means of a pin 115 carried by the hook and projecting through a slot 116 in the slide plate into an arcuate guide slot 117 in the cover plate 118 of the casing. In this case, however, the leg 119 of the slide plate 114 projects from the upper end of the casing and is connected to the lower end of the connector bar 20. Also, since the hook 7 is required to pivot in the opposite direction to the hook 6 in response to movement of the slide plates 105 and 114 in the same direction as each other by the rack member 62, the positions of the pin 115 and the cooperating slots 116 and 117 in the lower device 5 are different from those in the upper device 4.

As mentioned earlier, when the locking hooks 6 and 7 are advanced to their operative positions they pass through apertures in the keep bar 9 and into recesses in the frame to which the keep bar is fixed. For the purpose of drawing the door or window tightly into

its closed position, the side face 120 of the free end portion 104 of each hook 6, 7 is chamferred on the side facing the side on which the door or window opens, so that the chamferred face 120 will engage the side edge of the respective aperture of the keep bar and exert a camming action which draws the door or window tightly closed as the hooks 6 and 7 are advanced through the apertures. It is therefore necessary to be able to adjust the position of the operative side edge of each aperture in order to ensure that it is engaged by the chamferred face 120 of the respective locking hook in order to produce the desired pull-in of the door or window, and it is for this reason that the adjustable slotted plates 28, 29 are mounted on the keep bar 9 over the slots 26, 27. The construction and mounting of the upper keep plate 28 on the keep bar 9 is shown in Figures 10 to 12, and it is to be understood that the construction and mounting of the lower keep plate 29 is the same.

As shown, beyond each end of the slot 26 the keep bar 9 is provided with a screw clearance hole 121, 122, each arranged in the middle of a series of longitudinally extending serrations 123, 124 spaced apart across the bar, and beyond each series of serrations the bar 9 has a punched hole 125, 126. The keep plate 28 is slightly narrower than the keep bar 9 and has a length approximately equal to the distance between the punched holes 125 and 126 in the bar, the ends of the plate 28 being provided with down-turned tabs 127, 128 which, in use, are inserted through the holes 125, 126 and turned under the bar 9. The keep plate 28 has a slot 129 which registers with the slot 26 of the keep bar 9 but is narrower than the slot 26. Also provided in the plate 28 are two countersunk transverse slots 130, 131 which register with the screw clearance holes 121, 122, and on the underside of the plate 28 in the region of each of the slots 130, 131 is a series of longitudinal serrations 132, 133 corresponding to the serrations 123, 124 of the keep bar. The keep plate 28 is secured on the keep bar by screws which are inserted through the slots 130, 131 and the holes 121, 122 and are screwed into a tapping plate 134 (Figure 1) located behind the keep bar, the serrations 132, 133 on the underside of the keep plate engaging with the serrations 123, 124 on the keep bar to maintain the set transverse position of the keep plate 28 on the bar 9. As will be appreciated, it is the slot 129 of the keep plate 28 which determines the effective aperture through which the locking hook 6 passes, and the position of the camming edge of the slot 129 can be adjusted by loosening the securing screws to allow the transverse position of the keep plate 28 on the bar 9 to be adjusted and then re-tightening the screws to re-engage the serrations. This provides a particularly simple and reliable method of adjustment.

Claims

1. A lock for a door or window comprising a latch which is spring biased towards an operative position and is retractable to allow the door or window to close, a latch operating mechanism for retracting the latch when the door or window is to be opened, a deadbolt which is movable between an operative, advanced position and an inoperative, retracted position by a deadbolt operating mechanism, and a key operated deadlocking mechanism for deadlocking the deadbolt in its operative position, the deadlocking mechanism comprising a pivotally mounted locking arm which is movable between a deadlocking position in which it prevents movement of the deadbolt operating mechanism to retract the deadbolt and an inoperative position in which the deadbolt operating mechanism is free to move the deadbolt, a pivotally mounted tumbler which is spring biased towards a rest position in which the tumbler prevents the locking arm moving to its deadlocking position when in its inoperative position and prevents the locking arm moving to its inoperative position when in its deadlocking position, and a follower member which moves in response to turning of the key so that when the key is turned to deadlock the deadbolt, the follower member acts on the tumbler to displace it from its rest position prior to engaging and moving the locking arm to its deadlocking position and then allowing the tumbler to return to its rest position, and when the key is turned back to undeadlock the deadbolt, the follower member acts on the tumbler to displace it from its rest position prior to engaging and moving the locking arm to its inoperative position and then allowing the tumbler to return to its rest position.

2. A lock according to claim 1, in which the locking arm and the tumbler lie in different planes and have transversely projecting stops which interengage to prevent movement of the locking arm to its deadlocking position or back to its inoperative position when the tumbler is in its rest position.

3. A lock according to claim 1 or claim 2, in which the locking arm has a forked end in which the follower member engages when moving the locking arm to its deadlocking position or back to its inoperative position.

4. A lock according to any one of the preceding claims, in which the locking arm is arranged so that turning the key sufficiently in the undeadlocking direction when the locking arm is in its inoperative position causes the follower member to engage and move the locking arm away from

the inoperative position in a direction opposite from the deadlocking position whereby the locking arm acts to retract the latch.

5. A lock according to any one of the preceding claims, in which the deadlocking mechanism comprises a key operated locking cylinder which can be retro-fitted to the lock, and the follower member is part of the locking cylinder.

6. A lock according to any one of the preceding claims, in which the latch operating mechanism comprises a bush for receiving the spindle of a handle, a rotary cam plate which is rotatable by turning the handle, and a pivoted latch lever on which the cam plate acts to cause the lever to retract the latch against its spring bias when the handle is turned in one direction.

7. A lock according to claim 6, when dependent on claim 4, in which the locking arm acts on the latch lever at the opposite end from the cam plate to retract the latch.

8. A lock according to any one of the preceding claims, in which the deadbolt operating mechanism comprises a bush for receiving the spindle of a handle, a follower gear which is rotatable by turning the handle, a reciprocable rack member which is engaged by the follower gear, and a transmission gear which is engaged by the rack member and which also engages a rack provided on the deadbolt so that the deadbolt moves in a direction which is substantially at right angles to the direction in which the rack member is movable.

9. A lock according to claim 8, in which, in its deadlocking position, the locking arm cooperates with the rack member of the deadbolt operating mechanism to prevent retraction of the deadbolt.

10. A lock according to claim 8 or claim 9 when dependent on claim 6, in which the bush of the deadbolt operating mechanism is the bush of the latch operating mechanism, the deadbolt being advanced by turning the handle which in use is engaged with the bush from a neutral position in the opposite direction to that in which it is turned to retract the latch.

11. A lock according to any one of claims 8 to 10, in which the deadbolt operating mechanism also comprises a second bush for receiving the spindle of second handle which is on the opposite side of the lock from the first handle and is rotatable about an axis offset from that of the first bush, the second bush acting on a second follower gear which engages the rack member so that the deadbolt can also be operated by turning the second handle.

12. A lock according to any one of claims 8 to 11, in which the transmission gear is a stepped gear so that the linear travel of the rack member produces a greater linear travel of the deadbolt.

13. A lock according to any one of the preceding claims, comprising a casing formed by a die-cast internal frame providing a rear and two opposite end walls of the casing, and two cover plates fastened to the frame on opposite sides thereof.

14. A multi-point locking assembly comprising a lock according to any one of the preceding claims, and at least one additional locking device which, in use, is connected to the lock by a connector bar such that a locking member of the or each additional device is advanced and retracted simultaneously with the deadbolt in response to linear movement of the connector bar by the deadbolt operating mechanism of the lock.

15. A locking assembly according to claim 14, in which the locking member of the or each additional locking device is a hook which is pivoted between its advanced and retracted positions by linear movement of a slide plate which is connected to the connector bar and which is connected to the hook by means of a pin carried by either the hook or the slide plate and engaging in a slot in the slide plate or the hook respectively.

16. An assembly according to claim 15, in which the pin also engages in an arcuate guide slot which is provided in a casing of the additional locking device and which is centred on the pivot axis of the hook.

17. An assembly according to any one of claims 14 to 16, including a keep bar which, in use, is fitted to the fixed frame surrounding the door or window and which is provided with an aperture through which the locking member of the additional locking device projects when the door or window is closed and the locking member is advanced to its operative position, the side face of the free end portion of the locking member being chamferred on the side facing the side on which the door or window opens, so that the chamferred face will engage the side edge of the keep bar aperture and exert a camming action which draws the door or window tightly closed as the locking member is advanced through the aperture.

18. An assembly according to claim 17, in which the aperture is defined by a slot in a separate keep plate which is mounted on the keep bar so that the slot registers with a slot in the keep bar, the position of the keep plate on the keep bar being adjustable in order to adjust the position of the camming side edge of the aperture to ensure that the desired pull-in of the door or window is achieved.

19. An assembly according to claim 18, in which the keep plate is secured to the keep bar by at least one screwed connection, and the position of the keep plate relative to the keep bar is set and maintained by a series of longitudinal serrations on the underside of the keep plate which engage with a corresponding series of longitudinal serrations provided on the surface of the keep bar when the or each screwed connection is tightened.

20. A multi-point locking assembly for a door or window, comprising a main lock having a latch which is spring biased towards an operative position and is retractable to allow the door or window to close, a latch operating mechanism for retracting the latch when the door or window is to be opened, a deadbolt which is movable between an operative, advanced position and an inoperative, retracted position by a deadbolt operating mechanism, and a key operated deadlocking mechanism for deadlocking the deadbolt in its operative position, and at least one additional locking device which, in use, is connected to the main lock by a connector bar such that a locking member of the or each additional locking device is advanced and retracted simultaneously with the deadbolt in response to linear movement of the connector bar by operation of the deadbolt operating mechanism, the locking member of the or each additional locking device comprising a hook which is mounted to pivot between its advanced and retracted positions by linear movement of a slide plate which is connected to the connector bar and which is connected to the hook by means of a pin carried by either the hook or the slide plate and engaging in a slot in the slide plate or the hook respectively.

21. A locking assembly according to claim 20, in which the pin also engages in an arcuate guide slot which is provided in a casing of the additional locking device and which is centred on the pivot axis of the hook.

22. A locking assembly according to claim 20 or claim 21, including a keep bar which, in use, is fitted to the fixed frame surrounding the door or window and which is provided with an aperture through which the hook of the additional locking device projects when the door or window is closed and the hook is advanced to its operative position, the side face of the free end portion of the hook being chamferred on the side facing the side on which the door or window opens, so that the chamferred face will engage the side edge of the keep bar aperture and exert a camming action which draws the door or window tightly closed as the hook is advanced through the aperture.

23. A locking assembly according to claim 22, in which the aperture is defined by a slot in a separate keep plate which is mounted on the keep bar so that the slot registers with a slot in the keep bar, and the position of the keep plate on the keep bar is adjustable in order to adjust the position of the camming side edge of the aperture to ensure that the desired pull-in of the door or window is achieved.

24. A locking assembly according to claim 23, in which the keep plate is secured to the keep bar by at least one screwed connection, and the position of the keep plate relative to the keep bar is set and maintained by a series of longitudinal serrations on the underside of the keep plate which engage with a corresponding series of longitudinal serrations provided on the surface of the keep bar when the or each screwed connection is tightened.

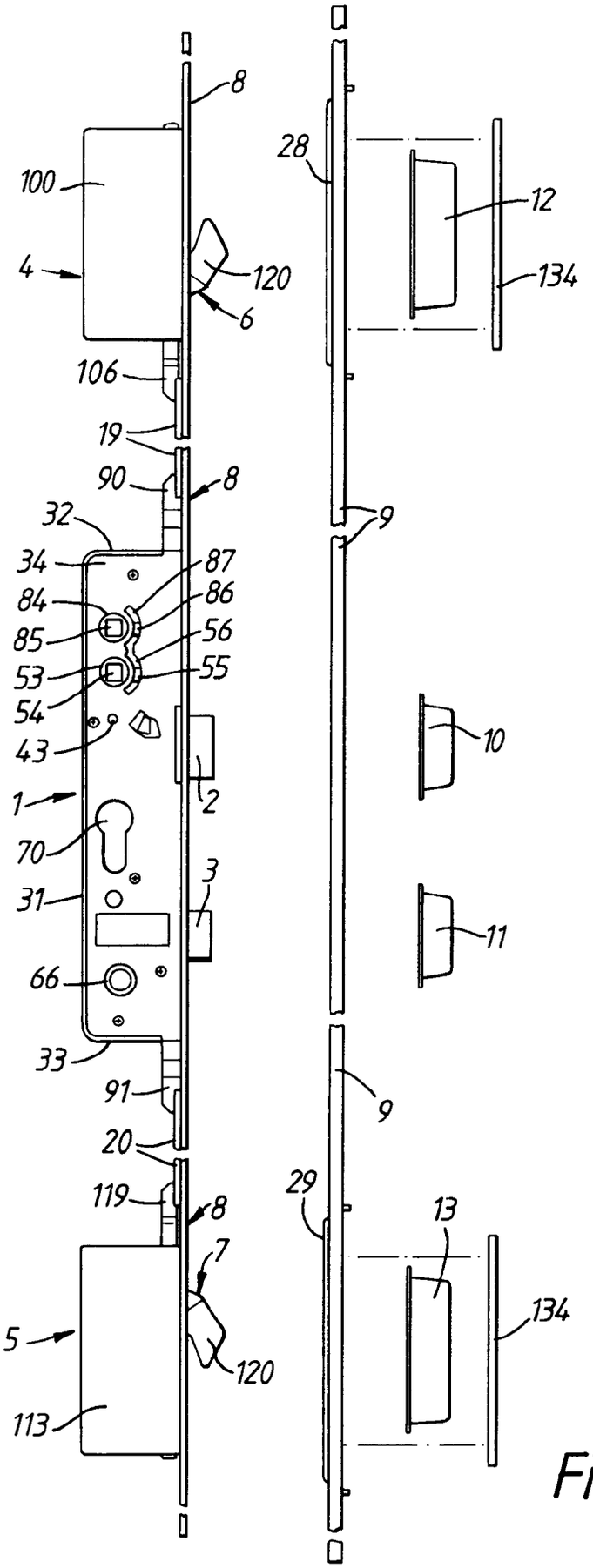

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Fig.1

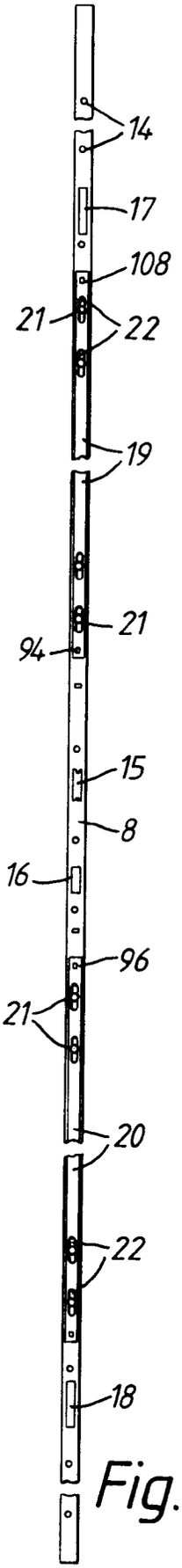

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Fig.2

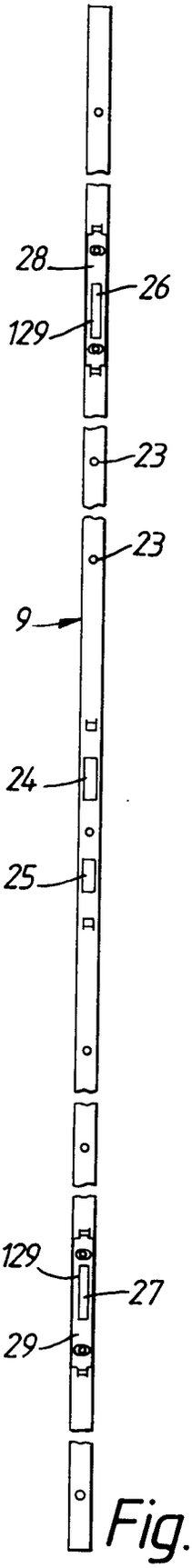

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Fig.3

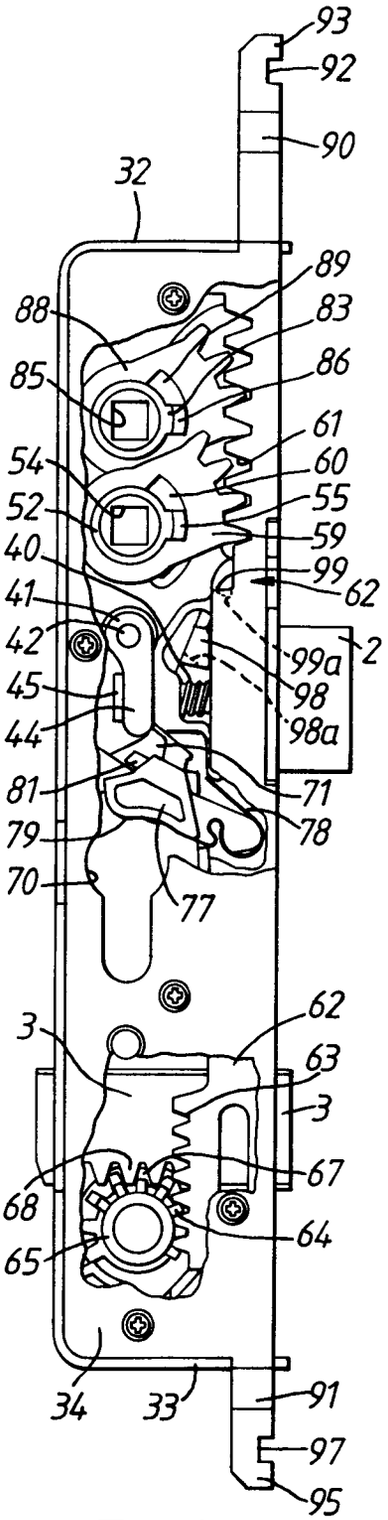


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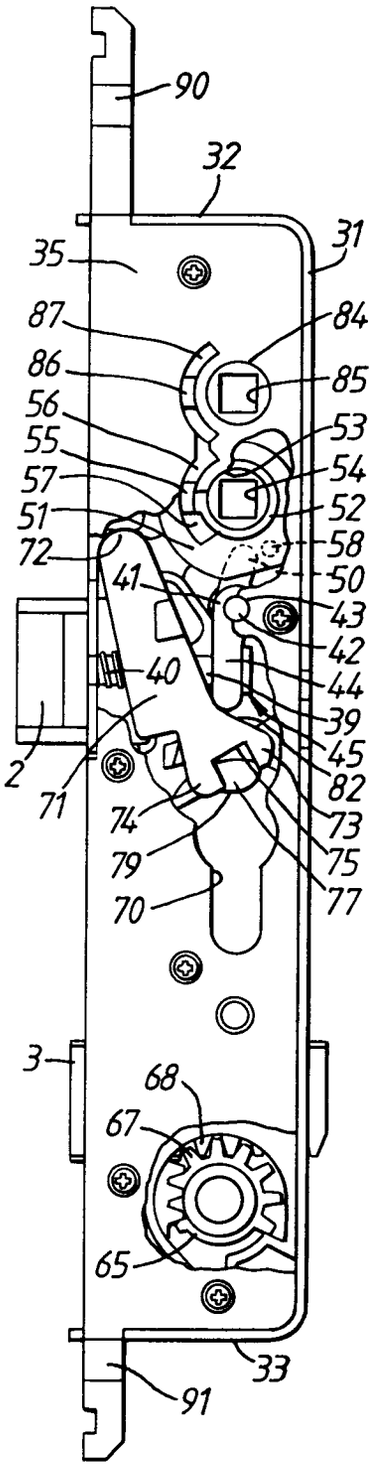


Fig.5

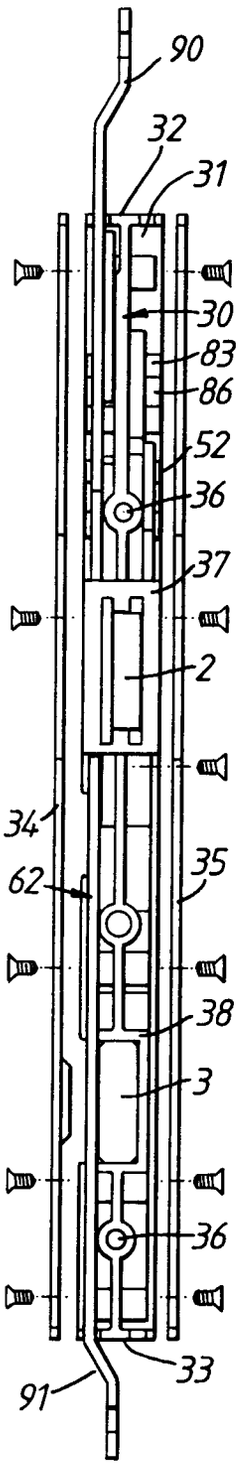


Fig.6

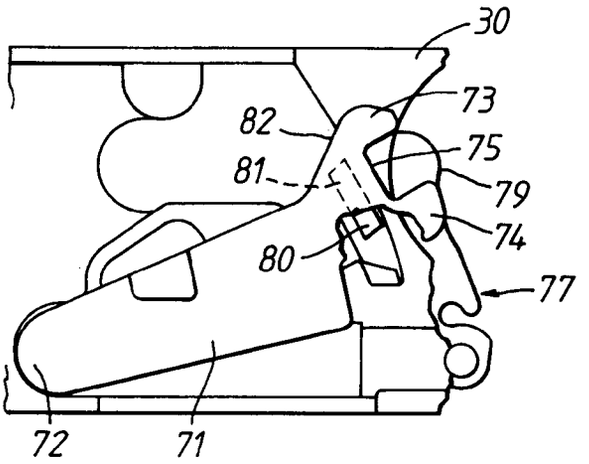


Fig.7a

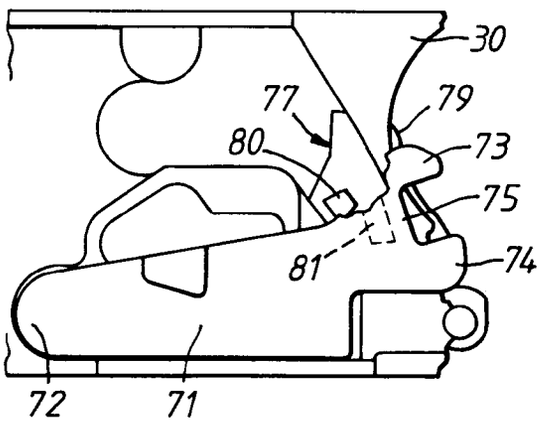


Fig.7b

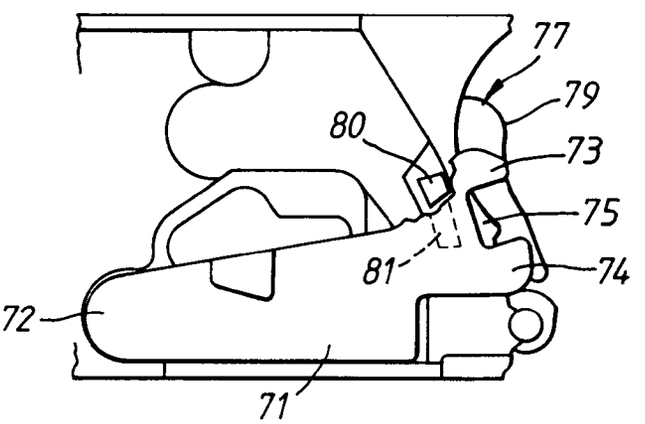


Fig.7c

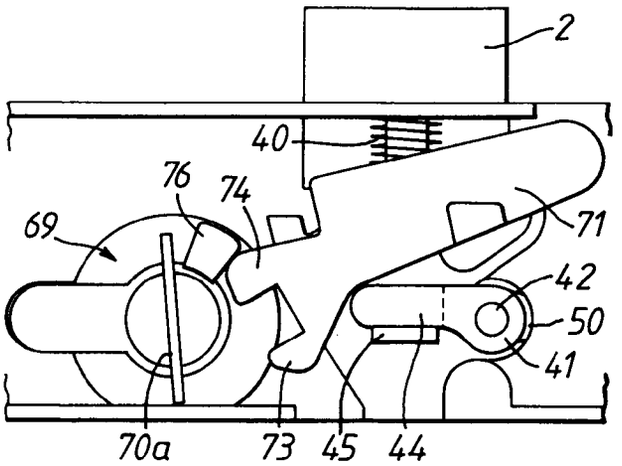


Fig.8a

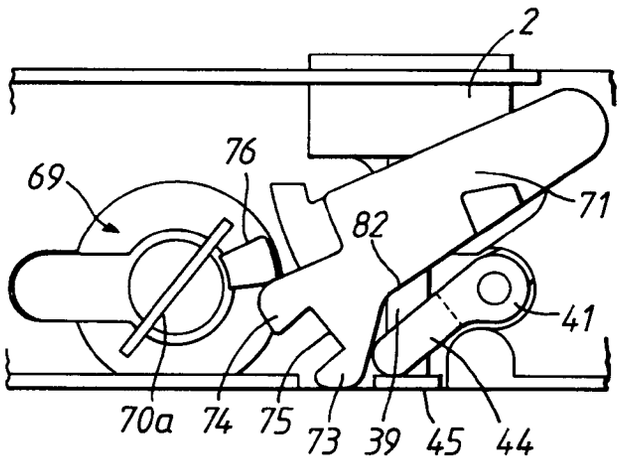


Fig.8b

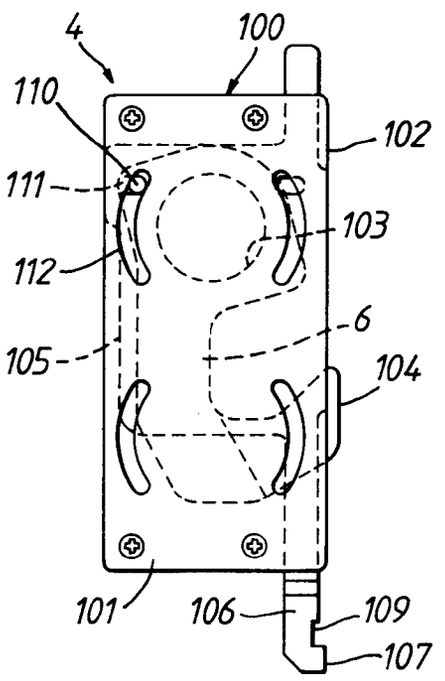


Fig.9a

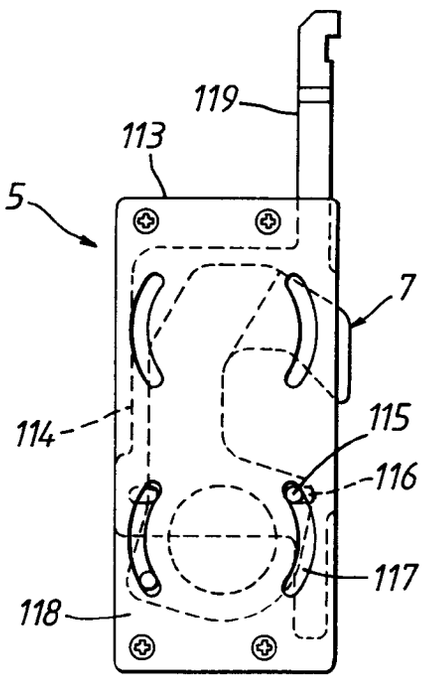


Fig.9b

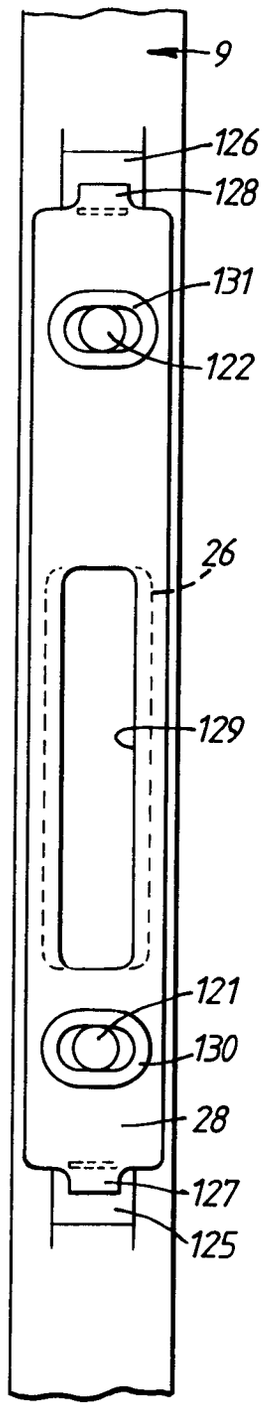


Fig.10

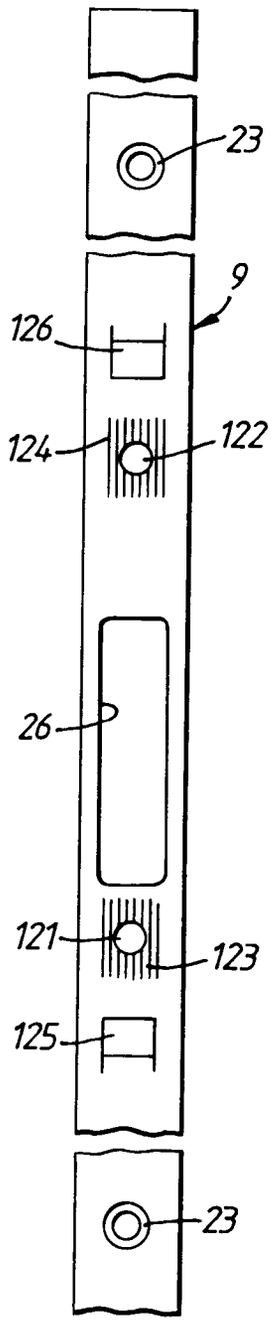


Fig.11

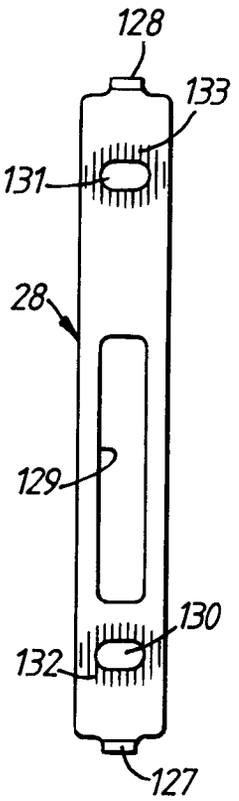


Fig.12