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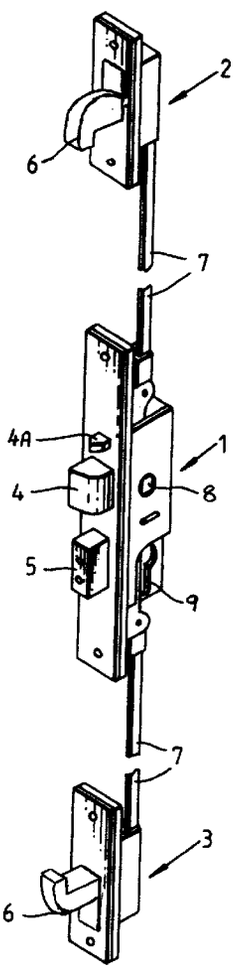
(54) Locks.

(57) A multi-point lock comprises a main lock unit 1 and upper and lower end units 2 and 3. Each end unit comprises a hook bolt 6 which is extended and retracted in the opposite pivotal sense to the other. Within each end unit there is a reciprocable rack 16 for pivoting the respective bolt 6 and a detent plate 24 for blocking forced retraction of the bolt when extended. In order to retract the bolt 6 the detent plate 24 is released by a pivoted link 19 operated by a drive bar 7 from the main unit 1 and through which the rack 16 is also operated.

Fig.1.



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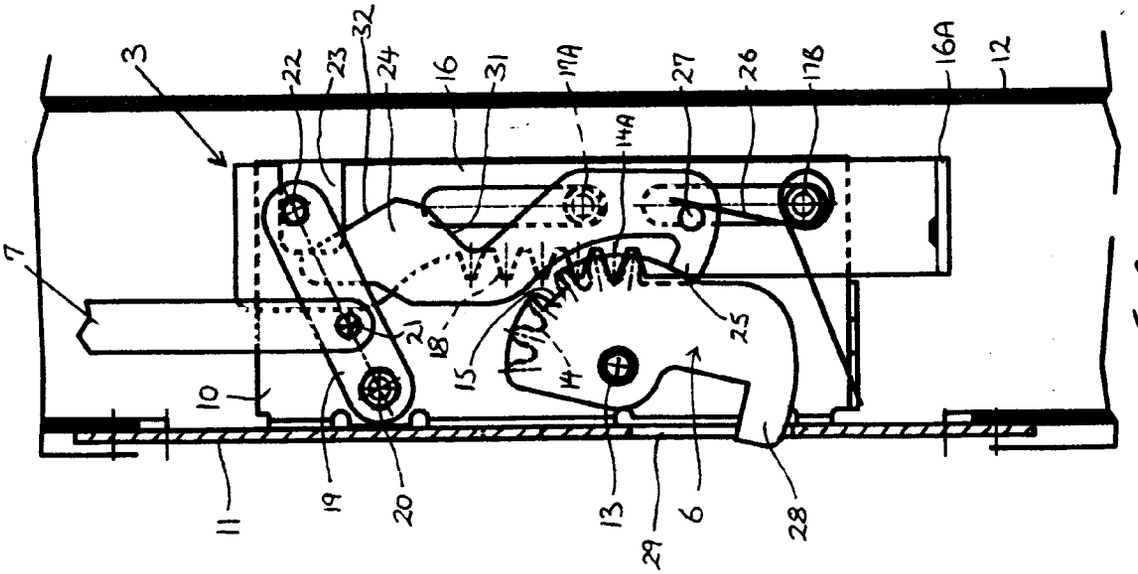
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16
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17A
14A
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17B
16A
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Fig.2

The present invention relates to locks for hinged or sliding doors, windows or other such closures and more particularly relates to so-called multi-point locks of the kind comprising a main lock unit and one or more bolts located remotely from the main lock unit but being operable therefrom through a mechanical drive linkage.

In one aspect the invention resides in a multi-point lock comprising a main lock unit and one or more further units located remotely therefrom; the or each said further unit comprising a respective bolt extendable and retractable from the main lock unit by means of a reciprocable drive linkage; the main lock unit comprising mechanism for reciprocating said drive linkage in response to the manipulation of one or more associated handles and a key-recognition mechanism for locking said drive linkage in the position corresponding to extension of the bolt(s) of the further unit(s); the bolt comprised in the or each said further unit having a hooked formation which is arranged to be extended and retracted by pivotal movement of the bolt; and the or each said further unit comprising means associated with the respective bolt for blocking forced retraction of the same when extended as aforesaid.

These and other features of the invention will now be more particularly described, by way of example, with reference to the accompanying drawings in which:-

Figure 1 is an isometric view of one preferred embodiment of a multi-point lock in accordance with the invention;

Figure 2 is a side view of the lower end unit of the lock of Figure 1, with a cover plate removed and its bolt retracted;

Figure 3 is a view similar to Figure 2 but with the bolt extended and locked; and

Figure 4 is a view similar to Figures 2 and 3 but in the initial stage of unlocking.

The multi-point lock of Figure 1 consists essentially of a central unit 1 and upper and lower end units 2 and 3, each intended for installation mortice-wise into the hollow stile section of an aluminium or uPVC door for example. The central unit comprises a lock having a sliding spring bolt 4 and associated deadlocking snib 4A, and a sliding dead bolt 5. Each end unit has a pivotal hook bolt 6 the movements of which are controlled from the central unit 1 via respective reciprocable drive bars 7.

The illustrated embodiment is intended for use on hinged doors and the central unit 1 may be of the same form as any of the corresponding central units disclosed in our United Kingdom patent applications nos. 2168105, 2242702 or 2268221 to which reference is directed. It is thus configured to receive at 8 a square-sectioned spindle from respective handles (not shown) on each side of the door by which the spring bolt 4 can be retracted and the drive bars 7 shifted, and to receive at 9 a key-operated locking cylinder (not shown) by which the dead bolt 5 can be extended and retracted and the drive bars 7 locked. In an alternative embodiment intended for use on sliding doors the illustrated bolts 4 and 5 will be replaced by one or more bolts of hook form or otherwise configured and operated as appropriate to the securement of a sliding door.

At all events, extension of the two end unit bolts 6 is accomplished from the central unit 1 by lifting either of the aforesaid handles to turn a thrower (not shown) in the unit 1 which slides the two drive bars 7 downwards in unison, and retraction of the two end unit bolts 6 is accomplished from the central unit 1 by depressing either of the aforesaid handles to turn the aforesaid thrower in the opposite sense which slides the two drive bars 7 upwards in unison. The mechanism within the lower end unit 3 by which the respective bolt 6 is shifted and locked will now be described with reference to Figures 2 to 4.

In Figure 2 the illustrated end unit 3 is shown with a mounting plate 10 and a forend 11 by which latter the unit is fixed within the door stile section 12. A cover plate has been removed to reveal its internal components. The bolt 6 is pivoted on a stump at 13 and is shown in Figure 2 in its retracted position. A sector of gear teeth are formed on the tail of the bolt at 14 but occupy only part of the width of the bolt, the arcuate surface 14A of the bolt tail in parallel with the teeth 14 being unbroken apart from a slot 15 provided for a purpose to be described hereinafter. A rack plate 16 for driving the bolt 6 is borne on two stumps 17A,17B so as to slide vertically in the rear of the unit 3 and is formed with teeth 18 in mesh with the teeth 14 of the bolt. The lower end of the rack plate is formed as a flange 16A to which may be mounted an additional shoot bolt (not shown) for engagement in the threshold. At the upper end of the unit a link 19 is pivoted on a stump 20 and is pinned at 21 to the end of the lower drive bar 7. At its free end the link 19 carries a peg 22 which engages in a slot 23 in the rack plate 16. The slot 23 is of greater vertical dimension than the diameter of the peg 22 so that there is a degree of lost motion in the transmission between the drive bar 7 and the rack plate 16. Finally, a detent plate 24 is pivoted on the stump 17A and is formed at its lower end with a hooked nose portion 25. It is biased in the clockwise sense (as viewed) by a spring 26 engaging a peg 27 on the detent plate so that the nose 25 is urged into contact with the untoothed arcuate tail surface 14A of the bolt 6.

In order to extend the bolt 6 from the position illustrated in Figure 2 the drive bar 7 is depressed, as shown in Figure 3. The link 19 is accordingly pivoted clockwise (as viewed) and after taking up the lost motion in slot 23 its peg 22 drives down the rack plate 16. The geared connection of the latter with the bolt 6 accordingly pivots the bolt clockwise (as viewed) so that its nose 28 passes out through an aperture 29 in the

forend 11 and hooks behind a keep plate 30 on the facing fixed door jamb, as also shown in Figure 3. At the same time, the nose 25 of the detent plate 24 runs along the arcuate tail surface 14A of the bolt until with the bolt fully extended it encounters the slot 15 and engages therein under the bias of the spring 26. The detent plate 24 accordingly blocks the bolt 6 directly against any attempt to force it back, in addition to the blocking action applied to the drive bar 7 at the central unit 1. By virtue of the geared connection 14/18 the detent plate 24 also indirectly blocks the rack plate 16 (and any attached shoot bolt) from being forced up.

In order to retract the bolt 6 from the position illustrated in Figure 3 the drive bar 7 is lifted, to pivot the link 19 anti-clockwise (as viewed). During the initial retracting movement of the link 19, as the lost motion of its peg 22 in the rack plate slot 23 is taken up, its peg 22 engages a ramp surface 31 on the detent plate 24 to pivot the latter anti-clockwise (as viewed) so that the nose 25 of the detent plate is withdrawn from the slot 15 in the bolt. This is shown in Figure 4. Thereafter, the link peg 22 pulls up the rack plate 16 and releases the detent plate 24 so that the mechanism is returned to the Figure 2 condition.

Although not shown, a tension spring is preferably applied between the rack plate 16 and part of the fixed casing of the end unit to bias the rack plate upwards and take up any backlash in its bolt-retracting movement. Furthermore, the arcuate tail surface 14A of the bolt 6 may have a second recess into which the nose 25 of the detent plate 24 engages to prevent inadvertent movement of the bolt when in the retracted (Figure 2) position. The detent plate would then adopt a position pivoted somewhat clockwise from that shown in Figure 2 and would be released from the bolt by the action of the link peg 22 on an upper ramp surface 32 of the detent plate during the initial movement of the link 19 in the bolt-extending direction.

The bolt 6 of the upper end unit 2 is of course operated in unison with the bolt of the lower end unit 3. The form of the upper end unit may correspond to that of the lower end unit except that it is mounted in an inverted orientation and the action of its corresponding link 19 is accordingly reversed. In other words the corresponding link 19 will be pivoted in the upper end unit at a position corresponding to 21 in the lower unit and pinned to the upper drive bar 7 at a position corresponding to 20, so that lowering the upper drive bar will cause the upper bolt 6 to extend and lifting the upper drive bar will cause that bolt to retract. The upper end unit may also comprise an additional shoot bolt mounted to the corresponding rack plate flange 16A for engagement in the head of the door frame.

In use of the above-described lock the end unit bolts 6 provide reinforcement to the central unit bolts in resisting forcing loads applied to a hinged door in its opening direction. Most importantly, they also act to resist any attempt to prise apart the door and its frame in the perpendicular directions. Both bolts 6 hooking behind their respective keep plates 30 will resist attempts to spring the door rearwardly away from the jamb. The lower bolt 6 will resist attempts to lift the door out of its frame while the upper bolt 6 resists the opposite movement. Furthermore, it will be noted that the upper bolt 6 retracts upwardly while the lower bolt 6 retracts downwardly. These bolts therefore could not be forcibly retracted in an attack upon the door by applying leverage between the upper bolt and the head of the door frame and between the lower bolt and the floor.

In a modification of the illustrated embodiment the lock is built with a continuous forend joining the three units 1-3 and the drive bars 7 are reconfigured and rerouted to run against this forend, so as to be suitable for accommodation in a so-called "Eurogroove" door stile section. The functionality of the respective units is, however, unaltered.

Claims

1. A multi-point lock comprising a main lock unit and one or more further units located remotely therefrom; the or each said further unit comprising a respective bolt extendable and retractable from the main lock unit by means of a reciprocable drive linkage; the main lock unit comprising mechanism for reciprocating said drive linkage in response to the manipulation of one or more associated handles and a key-recognition mechanism for locking said drive linkage in the position corresponding to extension of the bolt(s) of the further unit(s); the bolt comprised in the or each said further unit having a hooked formation which is arranged to be extended and retracted by pivotal movement of the bolt; and the or each said further unit comprising means associated with the respective bolt for blocking forced retraction of the same when extended as aforesaid.

2. A lock according to claim 1 wherein the or each said further unit comprises a toothed rack operable to reciprocate by reciprocation of said drive linkage and the respective bolt has a portion formed with a sector of gear teeth in mesh with the rack whereby to pivot the bolt in respective senses in response to reciprocation of the rack.

3. A lock according to claim 1 or claim 2 wherein the or each said further unit comprises a pivotal detent member having a detent portion biased into contact with a surface of the respective bolt, said surface having a recess into which said detent portion engages when the bolt is in its extended portion to block forced retraction of the same; and further comprising means for pivoting said

detent member to release its detent portion from said recess when said linkage is operated to retract the respective bolt.

4. A lock according to claim 2 and claim 3 wherein the teeth of said rack and the detent portion of said detent member are located in parallel planes and said sector of gear teeth and said surface of the respective bolt extend in parallel along a tail portion of the bolt.

5. A lock according to claim 2 and claim 3 or to claim 4 wherein the drive linkage is connected to a pivotal drive member within the respective said further unit which pivotal drive member transmits reciprocation of said drive linkage into reciprocation of the respective rack and said pivotal drive member is effective to pivot the respective detent member as aforesaid when said linkage is operated to retract the respective bolt.

6. A lock according to any preceding claim comprising two said further units disposed respectively above and below the main lock unit, the bolts comprised in the further units being arranged to be extended and retracted in mutually opposite senses of pivotal movement.

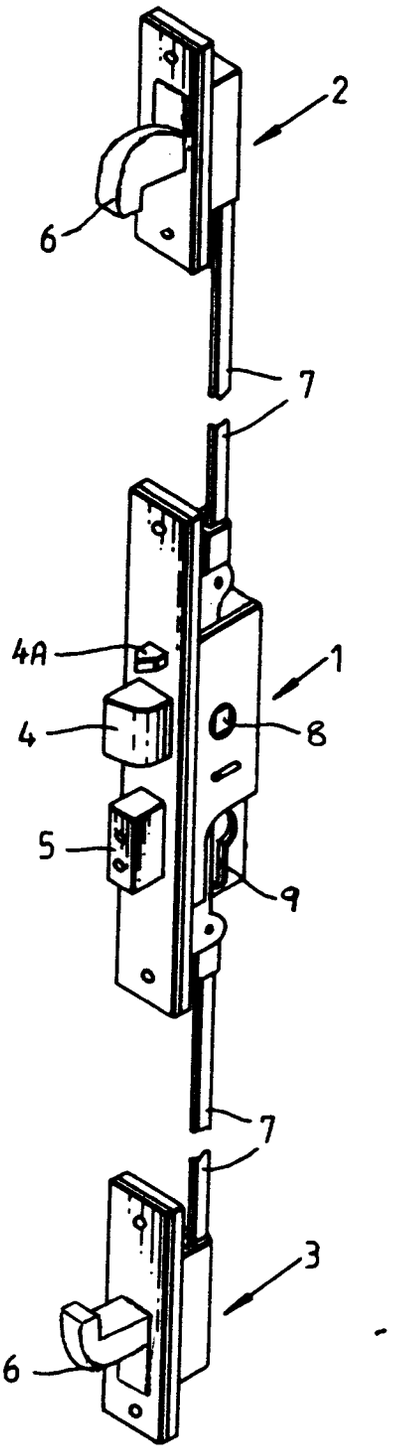
7. A lock according to claim 6 wherein the bolt comprised in the upper said further unit is arranged to retract its hooked formation in an upward arc and the bolt comprised in the lower said further unit is arranged to retract its hooked formation in a downward arc.

8. A lock according to claim 6 or claim 7 wherein the said drive linkage which operates the bolt comprised in the upper said further unit reciprocates in unison with and in the same sense as the said drive linkage which operates the bolt comprised in the lower said further unit.

9. A lock according to any preceding claim wherein the main lock unit comprises a spring bolt adapted to be retracted by said one or more associated handles.

10. A lock according to any preceding claim wherein the main lock unit comprises a dead bolt adapted to be extended and retracted by said key-recognition mechanism.

Fig.1.



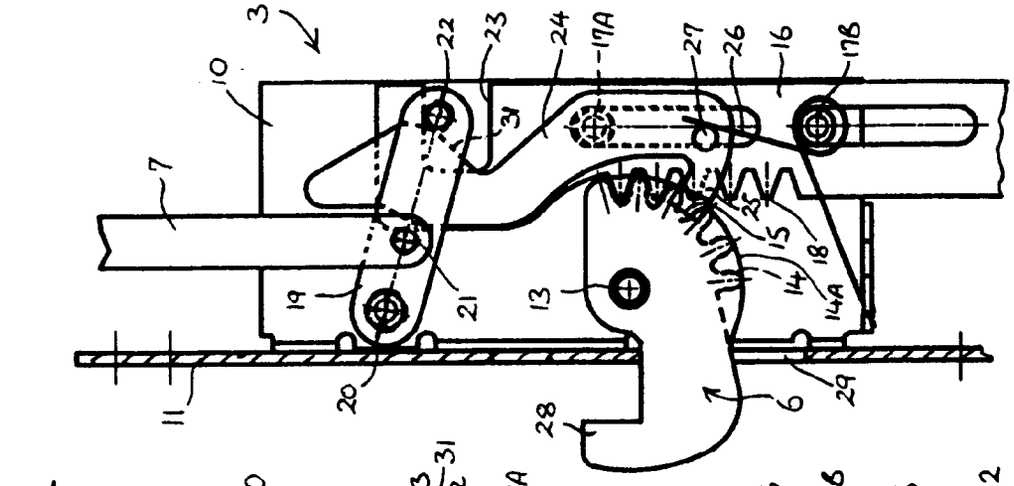


Fig.4

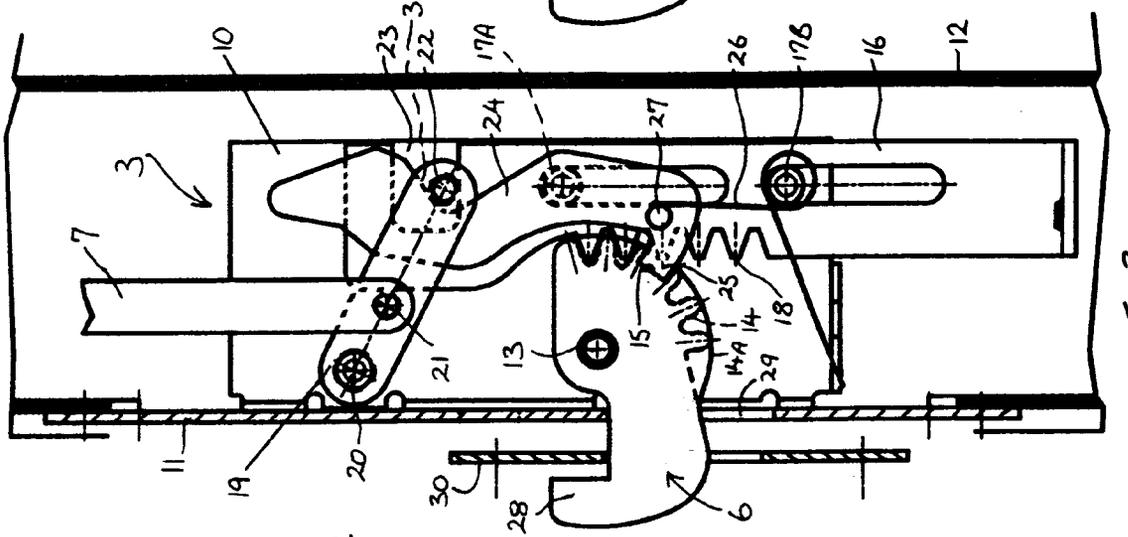


Fig.3

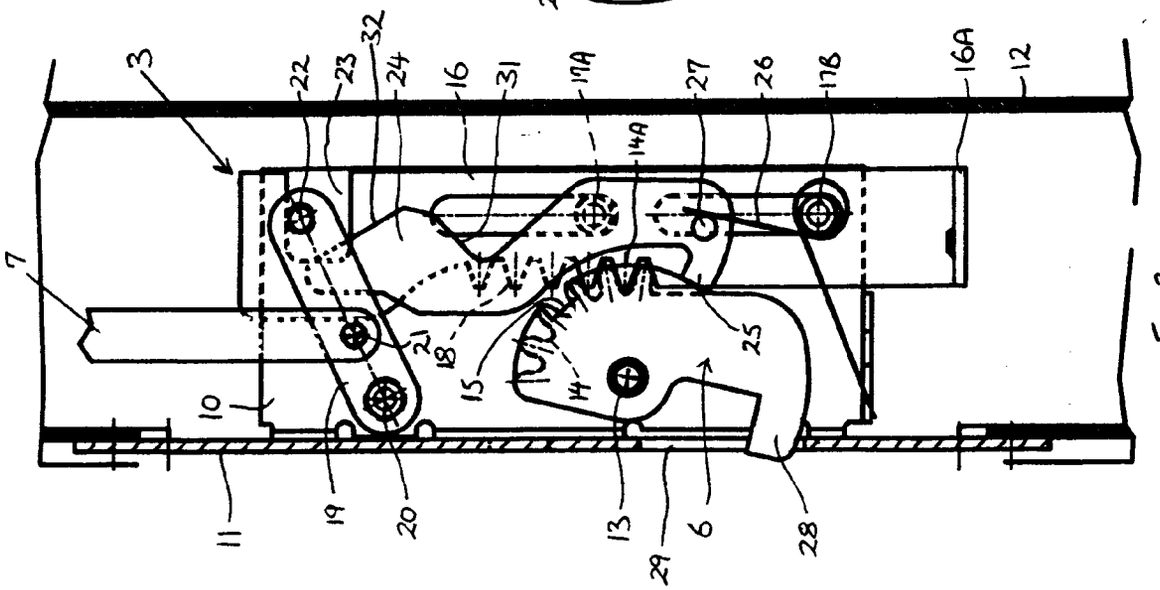


Fig.2

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EUROPEAN SEARCH REPORT

Application Number
EP 95 30 2797

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	DE-A-34 27 712 (KARRENBERG FA WILHELM) 30 January 1986	1,9,10	E05C9/18
A	* page 10, line 1 - page 11, line 7 *	6,8	E05B63/00
X	EP-A-0 411 271 (FLIETHER KARL GMBH & CO) 6 February 1991 * column 18, line 39 - line 48; claim 1; figure 31 *	1,9,10	
A	US-A-5 265 920 (KAUP LUDGER ET AL) 30 November 1993 * the whole document *	1,6,8-10	
D,A	GB-A-2 242 702 (PARKES JOSIAH & SONS LTD) 9 October 1991 * the whole document *	1	
D,A	GB-A-2 168 105 (PARKES & SONS LIMITED JOSIAH) 11 June 1986 * the whole document *	1	
D,A	GB-A-2 268 221 (PARKES JOSIAH & SONS LTD) 5 January 1994 * the whole document *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
E05C
E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21 July 1995	Verelst, P

CATEGORY OF CITED DOCUMENTS

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