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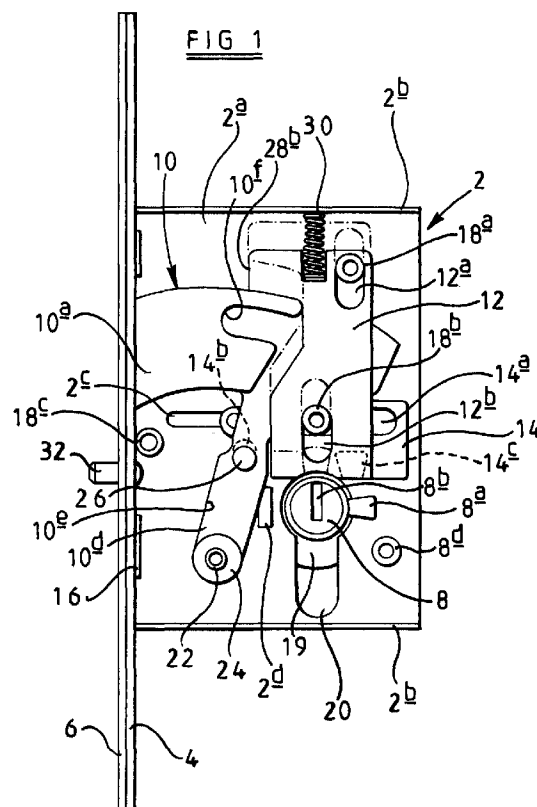
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(57) A lock comprises a body (2), a bolt member (10, 40) mounted for movement relative to the body (2), a drive means (8) and a link means (10d, 14, 42). The link means (10d, 14, 42) comprises a first member (14) slidable relative to the body (2) which is engageable with the drive means (8) for movement thereby. A second member (10d, 42), moveable about a pivot mounting (22), is driveably connected with the bolt member (10, 40) and the first member (10d) is coupled to the second member (14, 42) at a position between the pivot mounting (22) and the bolt member (10, 40), such that in use, activation of the drive means (8) causes movement of the first member (10d) which in turn produces a relatively larger movement of the bolt member (10, 40) (Fig 1).

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Description

The present invention relates to an improvement in the design of locks. More specifically, the present invention is concerned with improving the bolt action of locks.

In addition to a lock mechanism being resistant to tampering, the lock should not give way easily under a physical attack. One factor in determining how well a lock will resist physical attack is the depth to which the bolt is driven into the surrounding structure, eg. door frame, on locking. The degree of movement of the bolt between locked and unlocked positions is commonly referred to as the throw of the bolt.

In a conventional lock, the bolt is engageable with the locking mechanism via a rotatable cam which is driven by the locking mechanism. The throw of the bolt is determined by the radius of the cam and the proportion of its path during which it is engaged with the bolt, this being physically limited to less than 180°.

In a different type of lock, a larger throw of the bolt is achieved by rotating the cam through two or more complete revolutions so that it engages with the bolt on each revolution, thereby increasing the throw of the bolt. However, there is a potential security risk, in that the key can be removed after each revolution. Thus, it is possible for the bolt to be left in a partially thrown position.

It is an object of the present invention to provide a lock in which the throw of the bolt is increased as compared with conventional locks by means of a single or part revolution of a key.

According to the present invention, there is provided a lock comprising a body, a bolt member mounted for movement relative to the body, a drive means and a link means, said link means comprising a first member slidable relative to the body and engageable with the drive means for movement thereby, and a second member moveable about a pivot mounting, said second member being driveably connected with said bolt member, wherein said first member is coupled to said second member at a position between said pivot mounting and the bolt member, such that, in use, activation of the drive means causes movement of the sliding member which in turn produces a relatively larger movement of the bolt member.

In one embodiment, the second member forms part of the bolt member, in which case the bolt is known as a swing or hook bolt. In use, such a bolt has the advantage of being more difficult to prise from its keep. In addition, such a hook bolt is suitable for use in a slidably mounted unit eg. sliding door. Preferably, when used in such an application, the lock additionally comprises at least one outwardly extending pin which, in use, locates in a recess provided in a structure to which the slidably mounted unit is to be secured. The provision of such a pin prevents the slidably mounted unit from being levered in a direction parallel to an interface between the slidably mounted unit and the structure to which it is secured when the bolt is in a locked position.

Alternatively, the second member and bolt member may be integrally formed as a single component.

It will be understood from the above that the relative distance between (i) the position of coupling of the first and second members and the pivot mounting and (ii) the position of coupling of the first and second members and the bolt member determines the degree of leverage obtained.

The drive means may include mechanical, electromagnetic or electromechanical means, or a combination thereof. Preferably the drive means is a hand-operated key mechanism.

Preferably the lock is a dead-bolt lock. That is, once the bolt is in a locked position, it cannot be retracted into an unlocked position without activation of the drive means. More preferably, such dead locking is also provided when the bolt is in an unlocked position.

Deadlocking may be provided by a retaining plate mounted in the body for movement relative to said body, said retaining plate being resiliently biased towards the drive means, by for example a compression spring, and engageable with the drive means, such that in the locked or unlocked position, the bolt abuts the retaining plate such that the bolt may not be retracted or extended respectively, whereas activation of the drive means engages the drive means with the retaining plate which moves so that it no longer retains the bolt, said bolt being freely moveable between its locked and unlocked positions.

Thus it is to be understood that a single operation of the drive means effects both movement of the bolt and deadlocking.

Preferably, the bolt member has a shoulder region and the retaining member has a channel, such that in the unlocked position, deadlocking is achieved when the shoulder region is in the channel.

Embodiments of the present invention will be described, by way of example, with reference to the accompanying drawings in which;

Fig 1 is a view of a door lock according to the present invention in an unlocked position,

Fig 2 is a view of the lock of Fig 1 in an intermediate position,

Fig 3 is a view of the lock of Figs 1 and 2 in a locked position,

Figs 4, 5a, 5b and 6 are perspective views of part of lock shown in Fig 1 to 3, and

Fig 7 is a view of another embodiment of a lock according to the present invention.

Referring to Figs 1 to 6, a door lock comprises a body 2, a mounting plate 4, a face plate 6, a key-operated cylinder locking mechanism 8, a swing bolt 10, a bolt-retaining plate 12 and a linking member 14. The body 2 is formed by a first side plate 2a having substantially perpendicularly upstanding edges 2b, a portion of the mounting plate 4 which is riveted to flanges 16 up-

standing from the first side plate 2a, and a second side plate (not shown) which has a downwardly projecting edge and which is releasably secured to the first side plate 2a by screws at internally screw-threaded posts 18a, 18b, 18c, 18d.

The locking mechanism 8 is partially located in a passage 20 between said first 2a and second (not shown) side plates of the body such that it protrudes out of both ends of the passage, and includes a rotatable cam 8a which is located entirely within the body 2 and a key receiving slot 8b. First 19 and second (not shown) sleeve members encase the protruding portions of the locking mechanism 8 and are secured thereto, each in abutment with a different one of the first 2a and second (not shown) side plates, thereby preventing axial movement of the locking mechanism 8 in the passage 20. Unwanted rotation of the locking mechanism is prevented by a pair of projections 19a (Fig 4, only one shown) on the first sleeve member 19 which are located in the passage 20 in abutment with the first side plate 2a. The lock is rendered tamper resistant by the provision on the first side plate 2a of an upstanding ridge 2d which abuts the cam 8a when the lock is in its locked position (Fig 3). Thus, even if the second sleeve member is removed (as shown in Figs 1-3) the locking mechanism 8 is securely fixed in position by virtue of the abutment of the ridge 2d with the cam 8a and abutment of the projections 19a of the first sleeve member 19 with the first side plate 2a. Conversely there should be provision for dismantling of the lock. In its unlocked position and with the second sleeve removed (Fig 1), there is no abutment of the cam 8a with the first side plate 2a, allowing the projections 19a, and consequently the locking mechanism 8, to be withdrawn from the passage 20.

In this embodiment, the locking mechanism 8 shown is that which is described in more detail in co-pending British Application No. 9715114.6.

The swing bolt 10 has a head portion 10a with a shoulder 10b, a stepped region 10c being defined therebetween, and an arm portion 10d. The bolt 10 is mounted for movement relative to the body 2 about a first pin 22 and a pair of retaining washers 24 (only one shown) which are held between said first 2a and second (not shown) side plates at a free end of the arm portion 10d. The bolt 10 is of four piece laminate construction, with two inner pieces 10e (only one shown) forming the arm 10d and part of the head 10a and two outer pieces 10f (only one shown) forming the remainder of the head 10a. In another embodiment (not shown), the bolt is of unitary construction formed by casting. In use, the head 10a of the bolt 10 may partially protrude from the body 2 through an aperture (not shown) provided in the mounting plate 4 and face plate 6.

The bolt 10 is moveable by the cam 8a of the locking mechanism 8, in use, via the linking member 14. The linking member 14 is provided with substantially perpendicular first 14a and second 14b slots, a recess 14c and a peg 14d (Figs 5a and 5b). The linking member 14 is

mounted in the body 2 for sliding movement (Figs 1-3), the direction and extent of such movement determined by a groove 2c in the first side plate 2a in which the peg 14d is located and the post 18b which is located in the first slot 14a. The linking member 14 is attached to an intermediate position of the arm portion 10d of the bolt 10 by a pin 26 which passes through the arm portion 10d and is located in the second slot 14b of the linking member 14.

The bolt-retaining plate 12 has a pair of parallel slots 12a, 12b, a recess 12c, a shallow indentation 12d and an abutment member 28 having first 28a and second 28b abutment surfaces (Fig 6). In the assembled lock (as shown in Figs 1-3) the plate 12 is located in the body 2 by posts 18a and 18b in slots 12a and 12b respectively, thereby allowing movement relative to the body 2 in a direction substantially perpendicular to the direction of movement of the linking member 14. The recess 12c in an end of the plate 12 remote from the locking mechanism 8 locates one end of a compression spring 30, the other end of the spring 30 abutting one upstanding edge 2b of the first side plate 2a, biasing the plate 12 towards the locking mechanism 8. The abutment member 28 extends towards the first side plate 2a. In the lock-open position (Fig 1) the first abutment surface 28a acts on the stepped region 10c of the bolt 10 so as to prevent the bolt 10 moving towards its lock-closed position. In the lock-closed position (Fig 3) the second abutment surface 28b acts on the shoulder 10b of the bolt 10 to prevent the bolt 10 moving towards its lock-open position.

A retaining pin 32 is riveted to the mounting plate 4 and projects through the face plate 6. In use, the retaining pin 32 locates in a recess provided in the keep of the lock (not shown). This is particularly advantageous when the lock is fitted to a sliding door (not shown) in that it prevents leverage of the door perpendicularly to its sliding direction, when the door is closed.

In use, to close the lock, a key (not shown) is inserted into the receiving slot 8b of the locking mechanism 8 and turned so as to cause rotation of the cam 8a. The cam 8a abuts the bolt-retaining plate 12 and further rotation of the cam 8a causes the bolt-retaining plate 12 to move against the bias of the compression spring 30 (the shallow indentation 12d in the retaining plate 12 facilitates smooth operation of the locking mechanism 8) until the first abutment surface 28a of the abutment member 28 is no longer in contact with the stepped region 10c of the bolt 10. The cam 8a, partially located in the recess 14c of the linking member 14 then engages the linking member 14, with further rotation of the cam 8a causing the linking member 14 to slide towards the mounting plate 4 which by virtue of the attachment of the linking member 14 to the arm portion 10d of the bolt 10 causes the bolt 10 to pivot about the pin 22, since movement of the bolt 10 is no longer restricted by the retaining plate 12, resulting in the head portion 10a of the bolt 10 extending through the aperture in the mount-

ing plate 4 and the face plate 6. The pivoting movement of the bolt 10 causes the pin 26 to move perpendicularly relative to the sliding movement of the linking member 14 so that the pin 26 rides in the second slot 14b provided in the linking member 14 (see Fig 2). Still further rotation of the cam 8a moves the cam 8a away from the retaining plate 12 which returns to its original position due to the bias of the compression spring 30 and which deadlocks the bolt 10 in its locked position as described above (Fig 3).

Opening of the lock involves rotation of the cam 8a in the opposite direction and is similar to the closing operation described above. Initial rotation of the cam 8a moves the second abutment surface 28b of the abutment member 28 away from the shoulder 10b of the bolt 10, allowing the bolt 10 to be retracted into the body 2 of the lock by further rotation of the cam 8a. Still further rotation of the cam 8a moves the cam 8a away from the retaining plate 12 which returns to its original position due to the bias of the compression spring 30 and which deadlocks the bolt 10 in its unlocked position as described above (Fig 1).

In both locking and unlocking operations, the complete throw of the bolt 10 is achieved by turning the key (and hence the cam 8a) through 180°. For a given bolt 10, the closer that the linking member 14 is attached to the pin 22, the greater the throw of the bolt 10 for the same turn of the key.

Referring to Fig 7, similar parts to those in the previous embodiment are accorded the same reference numerals. The swing bolt 10 of Figs 1-3 is replaced by a sliding bolt 40 and a pivot member 42. The sliding bolt 40 has a slot 40a substantially parallel to the first slot 14a of the linking member 14 and is mounted about the pin 44 for sliding movement substantially parallel to the movement of the linking member 14. A projection 40b on the bolt 40 has first 40c and second 40d ramped surfaces which deadlock the bolt 40 by abutment with the first abutment surface 28a (unlocked) and second abutment surface 28b (locked) respectively of the retaining plate 12. The pivot member 42 has an arcuate end region 42a which is coupled to the bolt 40 by location in a recess 40e in the bolt 40.

In use, the lock operates as described for the previous embodiment, except that the movement of the bolt 40 is linear and driven by the linking member 14 through coupling with the pivot member 42, the latter pivoting about the pin 22. The throw of the bolt is increased by attaching the linking member 14 to the pivot member closer to the pin 22.

Claims

1. A lock comprising a body (2), a bolt member (10, 40) mounted for movement relative to the body (2), a drive means (8) and a link means, said link means (10d, 14, 42) comprising a first member (14) slid-

ble relative to the body (2) and engageable with the drive means (8) for movement thereby, and a second member (10d, 42) moveable about a pivot mounting (22), said second member (10d, 42) being driveably connected with said bolt member (10, 40), wherein said first member (14) is coupled to said second member (10d, 42) at a position between said pivot (22) mounting and the bolt member (10, 40), such that, in use, activation of the drive means (8) causes movement of the sliding first member (14) which in turn produces a relatively larger movement of the bolt member (10, 40).

2. A lock in accordance with Claim 1, characterised in that the second member (10d) forms part of the bolt member (10).
3. A lock in accordance with Claim 2, characterised in that the second member (10d) and bolt member (10) are integrally formed as a single component.
4. A lock in accordance with Claim 2 or 3, characterised in that at least one outwardly extending pin (32) is provided, said at least one pin (32) adapted to locate in a recess provided in a structure to which the lock is to be secured.
5. A lock in accordance with any preceding claim, characterised in that the drive means (8) is a hand-operated key mechanism.
6. A lock in accordance with any preceding claim, characterised in that the bolt member (10, 40) cannot be retracted from a locked position into an unlocked position without activation of the drive means (8).
7. A lock in accordance with Claim 6, characterised in that the bolt member (10, 40) cannot be extended from the unlocked position to the locked position without activation of the drive means (8).
8. A lock in accordance with Claim 7, characterised in that a retaining plate (12) mounted in the body (2) for movement relative to said body (2) is resiliently biased towards the drive means (8) and engageable therewith, such that in the locked or unlocked position, the bolt member (10, 40) abuts the retaining plate (12) such that the bolt member (10, 40) can not be retracted or extended respectively, and characterised in that activation of the drive means (8) engages the drive means (8) with the retaining plate (12) which moves so that it no longer retains the bolt member (10, 40), said bolt member (10, 40) being freely moveable between its locked and unlocked positions.
9. A lock in accordance with Claim 8, characterised in

that the bolt member (10, 40) has a shoulder region (10b) and the retaining plate (12) has an abutment surface (28a), such that movement of the bolt member (10, 40) from its unlocked position to its locked position is prevented by engagement between the shoulder region (10b) and the abutment surface (28a), thereby achieving deadlocking.

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